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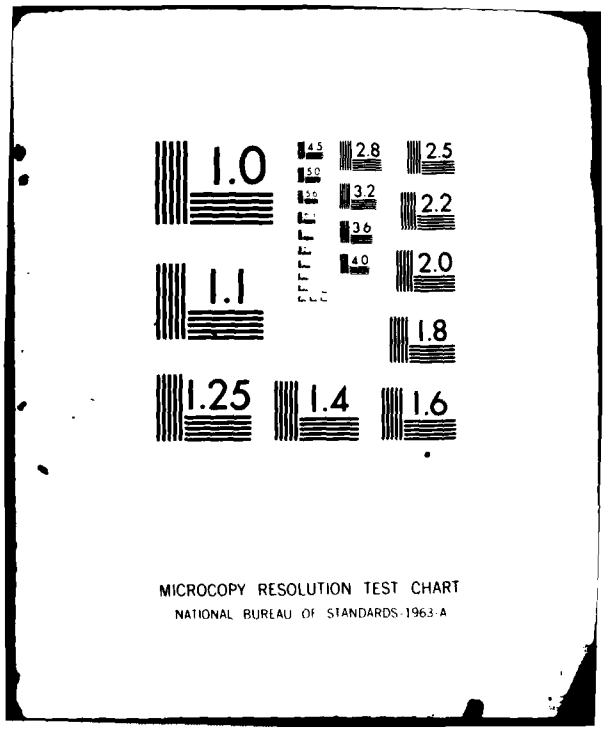
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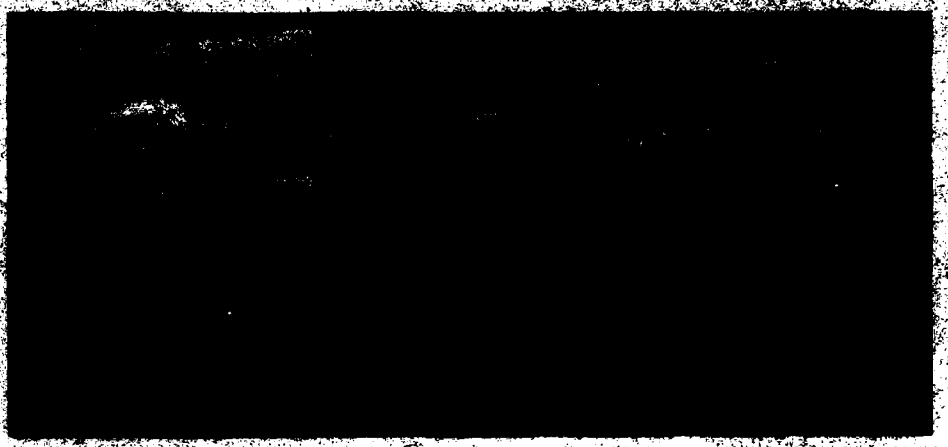

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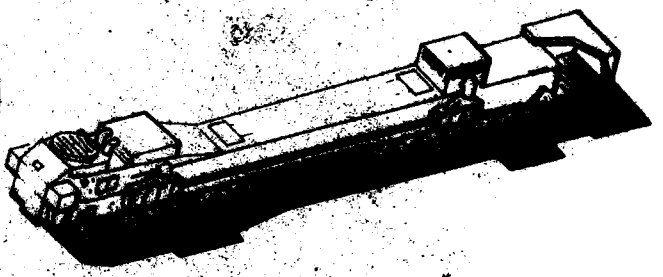
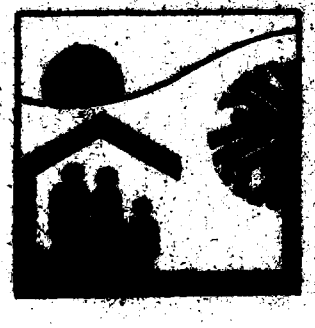


Environmental Impact Analysis Process



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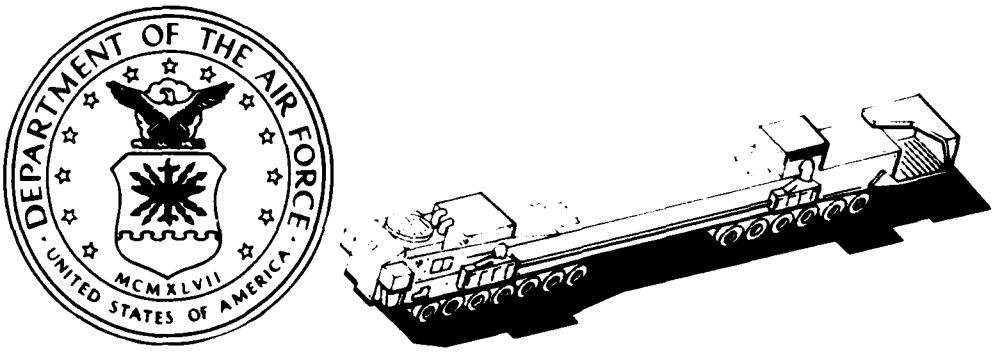
Appendices



Environmental Impact Analysis Process

DEPLOYMENT AREA SELECTION AND LAND WITHDRAWAL/ ACQUISITION DEIS

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DEPLOYMENT AREA SELECTION
AND
LAND WITHDRAWAL/ACQUISITION DEIS

CHAPTER 1: PROGRAM OVERVIEW

CHAPTER 1 PRESENTS AN OVERVIEW OF THE M-X SYSTEM AND THIS EIS INCLUDING:

- A DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES, INCLUDING SCHEDULE AND RESOURCE REQUIREMENTS
- AN OVERVIEW OF THE TIERED M-X ENVIRONMENTAL PROGRAM THAT INVOLVES SITE SELECTION AND LAND WITHDRAWAL
- A PRESENTATION OF PUBLIC SAFETY CONSIDERATIONS WITH PHYSICAL SECURITY AND SYSTEM HAZARDS
- A SUMMARY OF FEDERAL AND STATE AUTHORIZING ACTIONS ASSOCIATED WITH CONSTRUCTION AND OPERATIONS

CHAPTER 2: COMPARATIVE ANALYSIS OF ALTERNATIVES

CHAPTER 2 COMPARES THE ENVIRONMENTAL IMPACTS OF ALTERNATIVE M-X SYSTEM AND OPERATING BASE COMBINATIONS. DETAILS INCLUDE:

- THE SELECTION OF LOCATIONS FOR TWO SUITABLE DEPLOYMENT REGIONS, 200 CLUSTERS, AND SEVEN ALTERNATIVE OPERATING BASES
- PRESENTATION OF CONCEPTUAL CONSTRUCTION SCHEDULES, PERSONNEL REQUIREMENTS, AND RESOURCE NEEDS FOR EACH ALTERNATIVE
- COMPARATIVE ENVIRONMENTAL ANALYSIS BY ALTERNATIVE FOR EACH RESOURCE PRESENTED IN CHAPTERS 3 AND 4

CHAPTER 3: AFFECTED ENVIRONMENT

CHAPTER 3 DESCRIBES THE POTENTIALLY AFFECTED ENVIRONMENT IN NEVADA, UTAH, TEXAS, AND NEW MEXICO. ENVIRONMENTAL FEATURES OF BOTH BI-STATE REGIONS AND OF OPERATING BASE VICINITIES ARE PRESENTED. RESOURCES ADDRESSED INCLUDE:

- WATER, AIR, MINING, VEGETATION, AND SOILS
- WILDLIFE, AQUATIC SPECIES, AND PROTECTED PLANT AND ANIMAL SPECIES
- EMPLOYMENT, POPULATION, PUBLIC FINANCE, TRANSPORTATION, CONSTRUCTION RESOURCES, ENERGY, LAND USE, AND RECREATION
- CULTURAL RESOURCES, NATIVE AMERICAN CONCERNS, ARCHAEOLOGICAL AND HISTORIC FEATURES

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES TO THE STUDY REGIONS AND OPERATING BASE VICINITIES

CHAPTER 4 EXPANDS THE CHAPTER 2 ANALYSIS FOR EACH RESOURCE IN CHAPTER 3. ADDRESSING THE QUESTIONS RAISED IN SCOPING, CHAPTER 4 DISCUSSES THE FOLLOWING TOPICS ON A RESOURCE BY RESOURCE BASIS.

- THE REASON EACH RESOURCE IS IMPORTANT AND THE SOURCE OF SIGNIFICANT DIRECT AND INDIRECT IMPACTS
- THE INTERRELATIONSHIPS BETWEEN RESOURCES AND KEY CAUSES OF SHORT- AND LONG-TERM IMPACTS SUCH AS AREA DISTURBED AND POPULATION GROWTH
- MITIGATIVE MEASURES WHICH POTENTIALLY REDUCE IMPACTS
- A MATRIX OF POTENTIAL IMPACT SEVERITY BY GEOGRAPHIC AREA FOR THE PROPOSED ACTION AND EACH ALTERNATIVE

CHAPTER 5: APPENDICES

CHAPTER 5 CONTAINS AN M-X BASING ANALYSIS REPORT WITH APPLICATION OF SELECTION CRITERIA TO CANDIDATE BASING AREAS. ADDITIONAL SECTIONS INCLUDE:

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5.1 M-X BASING AREA ANALYSIS REPORT

SUMMARY (5.1.1)

The continued growth of the Soviet strategic forces poses a serious threat to the survivability of the U.S. ICBM forces during the 1980s. The security of the U.S. and its allies has and will continue to depend upon the viability of the U.S. strategic forces. The ICBM is a unique and integral part of these forces and M-X deployment is critical to the maintenance of this deterrent force. The Department of Defense considers M-X in MPS its highest priority defense program and the Administration and Congress have confirmed its national importance and the criticality of its schedule.

This paper describes the process used to select reasonable basing areas for M-X, concentrating on recent evaluations which led to the selection of two potential basing areas for further study. The selection process began in 1977 with consideration of the entire continental United States. This initial work surveyed basing needs, screened possible areas for M-X deployment, and finally identified six potential basing areas for deployment of M-X in Multiple Protective Shelters (MPS). Maps and descriptions of these areas are included in Appendix A. Previous criteria were augmented with military and operational considerations in order to identify which, if any, of the six potential basing areas were unreasonable to pursue.

From a military point of view, it is unreasonable to deploy M-X in a manner which unnecessarily increases (1) potential vulnerabilities; (2) the risk of reduced effectiveness in the face of unforeseen changes in international relationships or technology; or (3) the time, cost, or manpower to acquire and operate the system. Criteria that reflect these factors were developed and used to evaluate the six potential basing areas. These criteria included distance from the coast, distance from international borders, and compatibility with local areas and activities. Two areas, Nevada-Utah and West Texas-New Mexico, were found to be reasonable basing choices for M-X deployment and will be further analyzed in the M-X Deployment Area Selection and Land-Withdrawal/Acquisition Environmental Impact Statement (EIS), which will be published in late 1980.

INTRODUCTION (5.1.2)

M-X in a Multiple Protective Shelters (MPS) Basing Mode (5.1.2.1)

The U.S. central strategic forces are in the words of the Secretary of Defense, "...the foundation on which our security rests." "Without them," he continues, "the Soviet Union could threaten the extinction of the United States and its allies, with them, our other forces become more meaningful instruments of military and political power."

The greatest strategic danger the United States faces in the strategic area is the capability the Soviets will have by the early 1980s to destroy a large portion of U.S. intercontinental ballistic missiles (ICBMs), using only a relatively small portion of their ICBMs. Soviet doctrine holds that, if war is imminent, the Soviets should launch preemptive counterforce attacks to limit damage to their homeland. Hence, the vulnerability of U.S. ICBMs not only reduces the U.S. retaliatory capability, but also is destabilizing in crisis situations because it increases Soviet confidence in their ability to execute an effective counterforce strike.

After several years of extensive analyses, the Department of Defense determined that the best way to respond to the Soviet strategic buildup and counterforce capability was to insure survival of a U.S. ICBM retaliatory force through deployment of M-X missiles in a number of Multiple Protective Shelters (MPS). In his endorsement of this Department of Defense plan the President pointed out that "M-X is needed not only to preserve our own national security, but also to preserve the security of our friends and our allies."

The decision to proceed with the development of M-X in a Multiple Protective Structure (MPS) basing mode has been viewed by the President as the most crucial strategic forces decision made by the United States in more than 15 years. According to the Secretary of Defense an overall assessment of national security requirements required a solution that permitted continuation of the TRIAD with confidence in the survivability of each leg. MPS, according to the Secretary, provides that solution by enabling us to continue deployment of our most accurate rapid reacting leg of the TRIAD (Conus based ICBM's) in a way that ensures with high confidence that they will remain survivable into the distant future.

The fundamental goal of MPS is to deter an attack by confronting the aggressor with a situation in which they would always have to use more of their force than they could expect to destroy. In response to the currently projected Soviet threat, about 200 missiles will be deployed in 4,600 shelters. The location of the missiles will be concealed, so the Soviets would have to attack all shelters to destroy the M-X. The number of shelters will be sufficiently large so that the Soviet Union would essentially exhaust its ICBM resources in an attack and still leave sufficient surviving U.S. ICBMs for a meaningful U.S. retaliation. As an added precaution, supplementary modes will be available to hedge against threat increases on unexpected Soviet capabilities to reduce the effectiveness of concealment procedures.

In his formal announcement (07 September 1979) the President reiterated the need for M-X in MPS.

"However, as a result of increasing accuracy of strategic systems, fixed land-based intercontinental ballistic missiles, or ICBMs, located in silos such as our Minuteman, are becoming vulnerable to attack. A mobile ICBM system will greatly reduce this vulnerability. Therefore, I decided earlier this year to proceed with full scale development and deployment of a new, large mobile ICBM, known as the M-X. I made this decision to assure our country a secure strategic deterrent now and in the future."

The President also listed five essential criteria he had established for the basing system - - criteria the system must satisfy wherever it is based.

"At the time that I made the decision to build the M-X, I established five essential criteria which the basing system would have to meet. First, it must contribute to the ability of the strategic forces to survive an attack. Second, it must be verifiable so as to set a standard which can serve as a precedent for the verifiability of mobile ICBM systems on both sides. Third, it must minimize the adverse impact on our own environment. Fourth, its deployment must be at a reasonable cost to the American taxpayer. And fifth, it must be consistent with existing SALT agreements and with SALT II goals of negotiating for significant mutual reductions in strategic forces."

Congress has also recognized the need for M-X in MPS and its urgency. While Congressional action has clearly shown concern for minimizing adverse economic and environmental impacts, it has also emphasized the importance of the system and the need to deploy the system as early as possible. The Department of Defense Supplemental Appropriation Authorization Act, 1979, contained the following:

"Sec. 202. (a) It is the sense of the Congress that maintaining a survivable land-based intercontinental ballistic missile system is vital to the security of the United States and that development of a new basing mode for land-based intercontinental ballistic missiles is necessary to assure the survivability of the land-based system. To this end, the development of the M-X missile, together with a new basing mode for such missile, should proceed so as to achieve Initial Operational Capability (IOC) for both such missile and such basing mode at the earliest practicable date."

Current Action (5.1.2.2)

The decisions explained in this paper are a part of a continuing selection process entailing the successive application of several sets of screening criteria and the identification of unacceptable or unreasonable basing areas. The process began several years ago with criteria involving geotechnical, cultural, safety, and other concerns, and it will continue until final, specific shelter sites are selected.

As the depth of the analyses increases, the breadth may decrease as accumulated information shows that some alternatives are unreasonable. By this process, the Air Force balances a variety of concerns - - military effectiveness, operational constraints, environmental impacts, resource efficiency, schedule risk, etc. Each stage of the screening employs criteria that, like most criteria, involve judgment. Clear breakpoints are unusual, but the preferred direction is usually obvious, and unreasonable alternatives are normally easy to distinguish.

Additional screening criteria reflecting military considerations were recently incorporated into the decision process. Through the examination of such factors as survivability, potential new threats, verification, preservation of missile location uncertainty, and interaction with other strategic forces, deployment criteria emerged which could be used to minimize actual and potential vulnerabilities, protect against unpredictable changes, and minimize resource requirements.

Reducing vulnerabilities to potential threats discourages the development of those threats. Unless the costs are exorbitant or there are obvious U.S. responses, the Soviets must be expected to take advantage of openings presented. Therefore, prudence dictates selection of a basing area or areas that not only considers the relatively short-term, predicted threat, but also minimizes vulnerabilities and facilitates effective U.S. responses to any potential threat.

A time horizon of at least 30 years should be used to cover the M-X operational lifetime. In a sense, planning for M-X is equivalent to having planned a strategic system over 30 years ago that would be viable today in spite of technological advances and changes in the world situation. Such planning would have had to be done in the late 1940s or early 1950s - - just prior to the first hydrogen bomb and the Korean War; 5 to 10 years before the first ICBM, the first satellite, and the Cuban Missile Crisis; 15 to 20 years before the first man on the moon and the Vietnam War; a time when the world's best computer could not compete with today's hand held calculators with their transistors and microelectronics; a time when the U.S. policy of containment was backed by unquestioned nuclear superiority. Unimagined changes will inevitably take place during the lifetime of M-X; planning requires great caution and careful hedging to accommodate future change with minimum impact on national security.

Hence, criteria were developed (Section 5.1.3) and used to evaluate the six potential basing areas, with the intent of providing reasonable protection relative to both expected and unforeseen problems (Section 5.1.4). The Nevada/Utah area and the West Texas/New Mexico area were found to be reasonable basing areas. The other four areas were found to involve unreasonable risks; therefore, no further evaluation of them was undertaken. Studies concentrated on the two reasonable alternative areas indicated above.

Environmental Screening (5.1.2.3)

Pursuant to the National Environmental Policy Act and DOD Directive 6050.1, the Air Force implemented an M-X environmental program which included the preparation of four Environmental Impact Statements (EIS). An EIS was prepared for the M-X Buried Trench Construction and Test Project. A second was prepared as an input to the Milestone II decision on full scale engineering development (FSED). FSED activities include preparation and publication of two EISs: one for use in the deployment area(s) selection and a second to be used as an input to the Milestone III decision for production and deployment.

The M-X Milestone II EIS compared the environmental effects of candidate basing modes by investigating the impact of deployment in seven Basing Mode Comparison Areas (BMCAs) of the United States. The BMCAs represented those regions in which suitable areas for basing M-X had been found. They were chosen after a careful screening of the entire nation using primarily geological and physical criteria.

First, coarse screening criteria were applied to the entire continental United States. This process excluded population centers, parks, Indian reservations, and other restricted-use areas from consideration. Intermediate and fine screening criteria applied to remaining areas excluded such things as parcels of aggregate land less than 500 square miles and areas with grades greater than ten percent.

For convenience, and because accumulations of suitable land could be grouped into large regions with relatively uniform environmental characteristics, the remaining land was grouped into these seven broad geographic areas:

Great Basin (most of Nevada and a portion of Western Utah)

Mojave (California)

Luke-Yuma (SW Arizona)

White Sands (Central and SW New Mexico)

West Texas (Panhandle)

High Plains (W. Central Texas, E. New Mexico)

S. Platte Plains (Nebraska, Colorado, and Kansas)

Studies leading to the Milestone II EIS used these areas to determine whether environmental considerations would show a preference for any of four candidate M-X basing modes (vertical shelter, horizontal shelter, hybrid trench, and slope-sided pool). Based upon this evaluation, the Air Force concluded that no one basing mode was, on balance, environmentally preferable to another. Although each basing mode had advantages and disadvantages that varied depending on the geographic areas considered, these differences were not significant enough to favor one basing mode over another. No attempt was made at that time to rank, select, or indicate a preference among basing areas.

However, two significant environmental factors common to all four basing modes became evident. First, a security approach which would restrict access to the aggregate basing area, termed area security, would require that extensive areas of land be reserved for exclusive Air Force use, a restriction which proved to be unacceptable. Second, as spacing between shelters increased, general deployment area requirements increased. Although actual land needed for exclusive M-X use remained constant, the total road requirements increased - - with associated impacts similarly increased.

The President decided against the area security system and directed the Air Force to adopt the point security system described in Chapter I of the EIS. In addition, extensive analysis of projected Soviet ICBM capabilities, nuclear effects, and shelter hardness was undertaken - - resulting in minimum spacing requirements. The current M-X baseline reflects these changes in the security system and spacing. It thus represents a balance between a variety of concerns.

Since the Milestone II EIS, the Air Force has continued to study and define the M-X/MPS system, permitting an evaluation of the interaction between potential

basing areas and military considerations. As a first step, the seven areas previously defined by environmental characteristics were redefined into six areas to reflect militarily logical deployment areas. The six areas are listed below. Maps and descriptions are included in Appendix A.

Nevada - Utah (Great Basin)

California (Mojave Desert)

Western Arizona (Sonoran Desert)

Arizona - New Mexico - Southwest Texas (Highlands)

Western Texas - New Mexico (Southern High Plains)

Colorado - Kansas - Nebraska (Central High Plains)

BASING AREA FACTORS AND CRITERIA (5.1.3)

Factors Considered (5.1.3.1)

This section covers a variety of factors which will be affected by the basing area selection. These factors reflect the essential criteria the basing system has to meet as established by the President. They will be used in Section 5.1.3.2 to define screening criteria.

Survivability

Assuring the enduring survival of a U.S. ICBM retaliatory force is the reason for M-X deployment. It is required to restore essential equivalence with the Soviets, through the maintenance of a survivable Triad.

The survivability of the M-X missile depends primarily on preservation of location uncertainty, or PLU. It is, therefore, not advisable to deploy M-X where PLU is difficult to maintain.

In the event that confidence in PLU is temporarily degraded, the system will contain supplementary mobility modes to restore PLU. One mode entails the movement of missiles to different shelters to reestablish concealment. Another allows the missile to be in motion between shelters but still able to reach the nearest shelter within the flight time of SLBMs.

These supplementary modes not only protect the survivability of the system in spite of an unforeseen failure in PLU, they also serve to discourage large Soviet efforts devoted to breaking PLU by reducing the payoff. Hence, it is important to deploy M-X where operation in a backup mobility mode is feasible and relatively invulnerable to enemy attack options.

In addition, survivability even in the face of unforeseen events or greater-than-expected threats is also crucial, and provisions have been made for such cases. In the event the Soviets decide to abandon all arms control constraints and undertake a massive "arms-race" buildup to attack M-X, the United States is maintaining, within the constraints of the Anti-Ballistic Missile Treaty, the option

to deploy a ballistic missile defense (BMD). As with supplementary mobility modes and PLU safeguards, the BMD option will help deter a massive Soviet buildup and it is, therefore, wise to deploy the M-X where the optional BMD system will be effective and relatively invulnerable.

The employment and deterrent value of M-X requires survivable, reliable communications. In addition, many essential actions, such as transmittal of launch orders, backup mobility mode instructions, Ballistic Missile Defense (BMD) activation, etc., require time-critical communications. Precautions against Soviet disruption of these communications are, therefore, required.

Peacetime Command, Control, and Communications will primarily use a fiber optic cable network connecting the shelters to ground-based Operational Control Centers (OCC). The OCCs are planned for peacetime operations. This peacetime system will be secure and equally effective regardless of the location of the deployment area. Soviet attempts to disrupt peacetime communications are not expected.

For M-X to remain effective, its C^3 system must operate during and after an all-out attack. Such an initial attack would probably destroy the OCCs and disrupt the fiber optic network. The system would then make a transition to radio as its primary C^3 mode. Surviving missiles would use a Medium Frequency (MF) radio system to relay missile readiness status and targeting information among themselves and to surviving command authorities.

If the OCC is lost in the post-attack period, information to and from the M-X missile force will be passed through an Airborne Launch Control Center (ALCC). Various radio systems will connect the ALCC to the National Military Command System (NMCS), which consists of separate ground and airborne C^3 facilities. The NMCS is the primary link from the President to his strategic forces.

ALCCs will not be able to operate over missile fields, due to potential nuclear effects from an attack on the field. Instead, they will operate outside the M-X field but within 200 mi of it in order to maintain a communication connectivity with the missiles. The location and size of the planned ALCC operating area provides relative immunity from base of the M-X ALCC while allowing acceptable communications between the ALCC aircraft and surviving missiles.

Verification

Adequate verification is the foundation of arms control and as such is a criterion for M-X MPS deployment. Not only must M-X be consistent with existing Strategic Arms Limitation (SAL) agreements and goals to negotiate mutual arms reductions, it must also set standards for verifiability of mobile ICBM systems on both sides. As a result, the Air Force developed verification procedures that were incorporated into the M-X system, several of which can be affected by activities in the basing area. These verification requirements were, therefore, used (Section 5.1.3.2) to help develop screening criteria.

Cost

Military effectiveness depends on the cost-effectiveness of component military force - - inefficiencies in one area are paid for with degraded capabilities

elsewhere. Thus, the M-X/MPS system design must minimize acquisition and operating cost, conserve resources, and avoid circumstances that would increase manpower needs. To the extent that cost is influenced by basing location, cost will be an element in screening criteria (Section 5.1.3.2).

The remaining criterion listed by the President concerns minimizing any adverse impacts of the system. The Department of Defense therefore has the responsibility in the screening process of minimizing environmental and socioeconomic impacts. For this reason costs should not automatically be reduced or eliminated whenever they do not contribute to military effectiveness. A careful consideration of many factors is required to determine which costs are reasonable or necessary and which should be avoided. Such careful consideration is an integral part of the continuing analyses and tradeoff studies which the Department of Defense already conducts during the system acquisition process and in the planning, programming, and budgeting process.

Screening Criteria (5.1.3.2)

Based on the factors in Section 5.1.3.1, three screening criteria were developed: distance from the coast; distance from international borders; and compatibility with the local area and activities. The rationale for and explanation of these criteria follow.

Distance From the Coast

The rationale for moving inland is that distance generally reduces the effectiveness of threatening sea-based forces. For physical threats such as aircraft or missiles, added distance directly increases the time needed to reach the target, increases probable warning time, and allows more time for defensive reactions. For electromagnetic threats, power requirements which are often limited to "line-of-sight" or "ground-wave" distances, can increase in relation to distance. Line of sight and ground wave distance become particularly important in a postattack environment where the ionosphere would be saturated thereby precluding its use to reflect Radio Frequency (RF) signals beyond line of sight.

Examples of the importance of distance from the coast in relation to specific types of threats are given below. While they cannot be inclusive of all potential future threats, they can be used to support a judgment of reasonable distance requirements.

Submarine-launched Ballistic Missiles (SLBMs)

SLBMs can threaten the M-X system while the missile is on its transporter outside a shelter unless steps are taken to insure sufficient time to provide warning, make decisions, move to another close-by shelter, insert the missile, and close up. Current Soviet submarine patrol areas and SLBM flight times will not pose a serious problem in any of the candidate basing areas. However, deployment areas at greater distances from the coast provide greater protection against potential advances in SLBM technology or changes in Soviet submarine deployment areas by providing additional reaction time for backup mobility modes. This additional time increases operational flexibility and confidence in successful implementation.

Jamming from Sea-based Forces

Another post-attack concern is the susceptibility to jamming of the MF radio communications links to and among surviving missiles. It must be anticipated that the Soviet Union would try to disrupt communications by a combination of direct attack and electronic interference. All potential deployment areas would be vulnerable to some post-attack Soviet jamming threats. However, a greater distance between C^3 nodes and the jamming threat places the side trying to jam at more of a disadvantage and facilitates countermeasures. Because M-X internetted C^3 nodes will complicate jamming attempts, potentially effective Soviet jammers would probably be too large to deploy covertly on U.S. land and would require a ship or deployment area beyond the control of the United States. In the specific case of off-coast jamming threats using line-of-site or ground-wave RF propagation, the deployment areas further inland would be considerably less vulnerable to jamming.

Cruise Missiles

Currently, there is no projected cruise missile threat against M-X. It is nevertheless prudent to provide reasonable protection from cruise missiles launched off the coast of the United States both to facilitate responsive action and to avoid motivating the Soviets to develop and deploy such a threat.

Added distance will raise the performance requirements of the cruise missile, enhance warning probability and reaction time, and increase intercept opportunities. In addition, if the range required to strike M-X exceeds 600 km (373 mi), the cruise missiles would have to be counted under the terms of SALT II.

Exotic Sea-Based Threats

M-X in MPS will be operating well into the next century and should, therefore, be provided reasonable protection against high-technology, long-range threats. Examples of such threats are radar homing missiles to suppress BMD radars during reentry of Soviet ICBM warheads, missiles with advanced sensors to attack missile transporters, and aircraft or ship-based interceptors to attack M-X during its boost-phase ascent. As with cruise missiles, added distance enhances warning, increases reaction time, and can deter Soviet development of such threats.

Potential technological advances over the next 10 to 30 years mean a boost-phase interceptor could be developed to attempt to catch the M-X missile after it is launched. However, the effective distance of a boost-phase depends strongly on the position of the interceptor relative to the M-X launch trajectory. Since M-X would probably launch northward over land, interceptors off the U.S. coast would be far from their optimum launch point, and their effective range would be limited to about 200 to 300 mi.

Criterion Definition

The above factors were considered in conjunction with potential protection provided by U.S. territorial waters and the ability to deploy U.S. forces in and over international waters. While firm breakpoints were not evident, general ranges of acceptability could be defined. All the above factors taken together, indicated that basing M-X 500 or more mi from the coast would preclude unnecessary introduction

of significant risks and greatly facilitate responses to unforeseen threats. As distance decreased below 500 mi, risks and response difficulties increased accordingly, with concerns becoming increasingly serious between 300 to 200 mi from the coast. Deployment less than 200 mi from the coast would entail unreasonable risks and would be worthy of further consideration only if deployment further inland proved impossible. Figure 1, p 5-20, depicts ranges from the coast.

Distance From International Borders

The logic for deploying M-X away from borders is similar to the logic for the "distance from the coast" criterion - -distance reduces vulnerabilities to unforeseen threats. Additionally, the land surrounding the M-X deployment area should be U.S. territory to avoid international complications in any investigation of suspicious activities and to inhibit meaningful intelligence collection. National jurisdiction over such land will provide timely control of activities that represent a danger to U.S. national security interests without a commitment of cooperation from foreign governments.

Distance from non-U.S. territory reduces the possibility of a haven for covert activities and precludes an enemy attack on the M-X system without penetration of U.S. borders and flight over U.S. territory. Therefore, the greater the distance from borders, the greater the enemy resources required to threaten M-X and the lower the chance of success because U.S. detection probability and warning time will be increased and response facilitated.

Examples of how distance from international borders can reduce potential risks are given below. While these examples cannot be inclusive of all potential future threats, they can be used to support a judgment on reasonable distance requirements.

Enhancement of PLU

Because the effectiveness of M-X depends on PLU complemented by mobility, a full spectrum of countermeasures is an integral part of the M-X program. Simulators in the M-X baseline provide the basis for a successful PLU program. Continual evaluation of potential new or improved means of detecting the M-X will identify unforseen susceptibility and incorporate countermeasures. Sweeps of the deployment areas will be routinely made to uncover implanted sensors. Distance from another country's borders is especially important if M-X is to be protected from covert sensors.

Sensors generally depend on transmission of energy through the ground or through the air. Transmissions through the ground are greatly reduced by abrupt changes in geology (e.g., alluvial valley to rocky mountains) making many modest sized valleys preferred over a few large valleys or plains. Transmissions through the air are generally "line-of-sight" and depend on altitude-distance relationships.

Increased distance from another country's sovereign territory limits the effective use of either ground or line-of-sight transmissions. It would, therefore, add an element of protection during periods of temporary PLU sensitivity between development of new or improved sensor threats and deployment of countermeasures. In addition, reduced sensor effectiveness should reduce the cost and time needed to

develop and deploy countermeasures. Compared to potential physical threats to M-X, sensor threats are concerns over relatively short distances. Based on an assessment of sensor technologies and the program to maintain PLU, threats with an effective range of over a few miles are not currently envisioned. However, it is prudent to remove any chance that an ambiguous situation could be exploited to cast doubt on the security of survivability of the M-X force. A buffer zone of 100 to 200 mi from international borders is advisable.

Active Enemy Actions

Many of the same concerns used to develop the "distance from the coast" criterion are valid in determining reasonable "distance from the border" requirements. In time of strife, the United States could control activities within its borders but could not depend on controlling activities outside its borders. Non-U.S. territory could provide potential aircraft approaches or covert deployment areas for a variety of threats against M-X: jammers, cruise missiles, threats to a potential BMD system, even boost-phase interceptors.

Concerns about sea-based threats are moderated by several factors. First and foremost, the United States currently enjoys friendly relations with its neighbors and, to the extent possible, they would oppose Soviet use of their sovereign territory. Second, because the Soviets would not be able to use their submarines or ships as launch platforms, the size of equipment they could use without overt deployment would be limited. Third, in the case of Mexico, a boost phase interceptor would have to chase and catch an M-X missile which would be launched northward limiting the effective intercept distance to under 200 mi.

On the other hand, protection comparable to that afforded by U.S. territorial waters and the ability to position U.S. forces in and above international waters would not be available should these threats materialize.

Criterion Definition

In view of all of the above factors taken together, it was considered that basing M-X more than 500 mi from an international border would preclude unnecessary introduction of significant risks and greatly facilitate respon ses to unforeseen threats. As distance decreases below 500 mi, risks and response difficulties increase accordingly, with concerns becoming serious between 300 to 200 mi from an international border. Deployment less than 200 mi from an international border would entail unreasonable risks and would be worthy of further consideration only if other basing areas proved impossible. Figure 2, p 5-21, depicts ranges from international borders.

Compatibility With Local Area and Activities

Studies are under way to analyze the environmental and socioeconomic impact of proposed actions and develop ways to minimize adverse impacts. The reverse process is also required; namely, to assess how the local area and activities will affect military effectiveness and operational procedures.

If M-X is deployed in an area with substantial existing activities and a relatively high population density, siting actions must, to the extent possible, avoid

plots of land with relatively high use and development. Since the Air Force will have to work with the local population for the life of the system, mutually supportive community relations are very important. It is Air Force policy to avoid condemning land or restricting its use except where no reasonable alternative exists.

One way to mitigate local impacts is to site around existing buildings. Such siting would either decrease or increase the spacing between shelter sites relative to baseline levels. Reducing spacing would make the shelters vulnerable to multiple kills by single Soviet reentry vehicles and would involve deploying shelters and building roads in a non-optimum manner. Increased distances between shelters increases the total area affected by deployment, time lines for mobility modes, manpower, and equipment requirements. Either way, the need to deploy sites around existing structures will affect acquisition and operating costs and lessen M-X effectiveness.

Impact of Land Use on M-X Operations

From the onset of the M-X program, land use has been a primary consideration. Included in this consideration are desires to minimize acquisition of land for exclusive M-X use, to maximize use of public land rather than private, and to avoid unnecessary use of productive land. Not only is careful attention to land use consistent with DOD policy and the Air Force's interpretation of Congressional intent, it also, as explained in the next two sections, enhances verification, facilitates PLU activities, and tends to minimize operational costs.

Obtaining private land, whether owned by individuals or non-federal jurisdictions, may require condemnation if owners will not voluntarily sell or if condemenation is the only means of obtaining clear title. Siting regions containing large amounts of private land are relatively undesirable because of public reaction to condemnation procedures.

Acquiring private land may entail significant cost and schedule risks. The legal requirement to pay severance damages plus the complicated process of identifying large numbers of individual tracts and owners, determining property values, making offers to buy, and, if necessary, condemning land, makes the entire procedures uncertain in terms of cost and time. The Air Force has the constitutional statutory power to take land over an individual owner's objections, but the option is extremely undesirable and is a last resort.

Public Law 96-29, dated 27 June 1979, Department of Defense Supplemental Appropriation Authorization Act 1979, Section 202 b states "....it is the sense of the Congress that the basing mode for the M-X missile should be restricted to location on the least productive land available that is suitable for such purpose."

The discussion in Congress indicated that the intent was to minimize acquisition of agriculturally productive land for M-X deployment. Therefore, basing areas that avoid agricultural activities are preferred. As discussed in the next two sections, this policy is also consistent with minimizing operational costs and enhances verification and PLU activities.

Verification

The open society that exists in the United States increases opportunities for the Soviet Union to verify the number of M-X missiles produced and deployed. However, M-X must still be verifiable by National Technical Means, both to set verification standards for Soviet mobile missile systems and to vitiate any Soviet contentions the M-X is not allowable under SALT agreements. Several characteristics aid verification and will be incorporated into the M-X/MPS system.

Provisions have been made for post-deployment inspection wherein a portion of the M-X field is uncovered so the number of missiles in a defined area of cluster can be counted unambiguously. A key to this process is assurance that missiles cannot be moved out of the field selected for inspection before the inspection actually takes place. To this end, normal roads into clusters will be barricaded to prevent missile "escape" without leaving obvious signs. (Means will be provided so that public and commercial vehicles, which are much smaller than a missile transporter, will be able to bypass the barricades.) Transit via other routes is normally prevented because the one million pound transporter could not easily traverse unprepared land and would leave observable tracks in the dirt for long periods of time.

As a result, well-prepared "escape" routes, very smooth land areas, and high levels of plowing or other agricultural activities that could be used to erase unauthorized missile tracks will be incompatible with high verification standards unless normal activities are restricted during inspecting periods.

On the other hand, areas with minimum agricultural activity are highly compatible with verification standards. Furthermore, verification is enhanced if areas have little rail or heavy truck traffic to mask missile movement or provide ambiguous signals and few nearby facilities large enough to assemble, store, or hide missiles. Confidence in verification would be even further enhanced if natural barriers such as mountains can be used to isolate the deployment area from potential missile assembly facilities.

Preservation of Location Uncertainty

Location uncertainty depends in some degree on a physical security system to indicate potential espionage activity very close to the shelters. This system, which includes security patrols and various sensors such as radar, is defined in Chapter I, paragraph 1.2.2.4.

The efficiency of the security system depends on determining if activity near a shelter merits investigation. A high degree of activity would lead to an inherent increase in false alarms, increasing security force requirements, and resulting in greater manpower and operating costs.

Areas expected to have high population densitites are, therefore, less operationally attractive than are areas with low densities. (Note: M-X would cause population growth in any of the candidate basing areas, but the addition of M-X would not be expected to change the relative population density ranking of each area.)

It is anticipated that periodic sweeps of the land around the shelters will be required to verify that sensors have not been surreptitiously implanted in an attempt

to determine missile locations. Such sweeps would be most compatible with undeveloped land and range land. Farmers may well object to people walking through their fields, and plowed fields make it harder to detect sensor implantations. Sweeps would not be compatible with extensive agricultural activities which in themselves disturb the land.

Criterion

Because the "compatibility with local area and activities" criterion contains a number of factors, this criterion is difficult to define in a straightforward manner. However, compatibility tends to depend on three highly correlated characteristics. Areas with very low rural populations, low activity levels, and primarily undeveloped land should be highly compatible with the M-X system and involve no significant operational problems. Areas with a modest rural population, low-to-medium activity levels, and primarily undeveloped land or rangeland are considered reasonable deployment areas; problems would increase, but could be solved with reasonable measures. Areas with high rural populations, high activity levels, or which are predominantly agricultural, are considered unreasonable basing areas.

APPLICATION OF CRITERIA TO CANDIDATE BASING AREAS (5.1.4)

This section provides the results of an evaluation of each of the six candidate basing areas using factors and criteria, the results of which are summarized in Chart 1, p 5-22.

Nevada/Utah (Great Basin) (Reference Figure A-2, p 5-28) (5.1.4.1)

Description

The suitable land in this area is mostly public land composed of valleys separated by mountains. Most of the acreage is rangeland with relatively few livestock, due to sparse vegetation. The land is made up primarily of desert shrubland with some areas containing small trees and brush.

The rural population in Nevada and Utah is very low, compared to other areas, with most rural residents in small towns. Inhabitants in outlying areas are widely separated except along cultivated river valleys. The Great Basin area contains no major population centers internally, but several are located south, east, and northwest, accessible by major highways. Siting alternatives removed from major urban centers are possible.

Evaluation

The area is located 300 to 500 mi from the coast (rated as having reasonable risks) and 300 to 500 mi from international borders (reasonable risks). Compatibility with M-X is rated high.

Minimum acquisition of private land is anticipated, including transportation right-of-ways in narrow valleys. Roads built for M-X would be available for local use. M-X in MPS would be compatible with other productive land uses and no significant agricultural impact is anticipated.

Due to the very low rural population and activity levels, basing of M-X in the area would require very few siting actions that would increase overall system costs. For the same reasons, the area is highly amenable to unambiguous verification and efficient PLU measures.

Overall, the Nevada/Utah area was considered a reasonable basing area for M-X in MPS, and in-depth environmental analyses have been directed for this area.

California (Mojave Desert) (Reference Figure A-3, p 5-29) (5.1.4.2)

Description

The suitable land in this area is also mostly public land composed of valleys separated by mountains. Most of the area has relatively little rangeland or agriculture, although both activities are present in the western portions of the area. The noncultivated areas are primarily desert shrubland. Overall rural population is significantly greater than the Nevada/Utah area, but still reasonably low. Population in the eastern portion of this area is comparable to the Nevada/Utah area.

The area is close to the greater Los Angeles population center and to Las Vegas, but is isolated from both by mountains. Major transportation corridors cross these barriers and transit the candidate area. These corridors provide access to the area for the large numbers of people from the Southern California area, and the M-X roads would improve access to off-highway land. It is expected that activity in some parts of the deployment area, primarily those portions with recreational attractions, could be high.

Evaluation

The area is located within 200 mi of the coast (rated as having unreasonable risks) and stretches between about 50 to 300 mi from the U.S.-Mexican border. (Over 60 percent of the area is rated as having unreasonable risks.)

Compatibility with M-X is rated as reasonable although access for visitors from the greater Los Angeles area via major highways may lead to verification and PLU difficulties in some part of the deployment area. (Parts of the western portion of the area would not rate as reasonable, but there is sufficient land in the overall area to avoid them.)

Overall, due primarily to the risks entailed in deployment within 200 mi of the coast, this area was not considered a reasonable alternative and was not selected for further study.

Western Arizona (Sonoran Desert) (Reference Figure A-4, p 5-30) (5.1.4.3)

Description

This area is 90 percent public land made up of valleys separated by mountains. It is composed of desert shrubland used for grazing. Rural population is within reasonable limits. The area is easily accessible from Yuma, Phoenix, and Tuxson via major highways and may be expected to attract visitors for recreational purposes.

Evaluation

The majority of this area is located 200 - 300 mi from the coast (reasonable risk), but it is within 200 mi of the United States-Mexican border (unreasonable risk).

Compatibility with M-X is well within reasonable limits, although somewhat lower population and activity levels would be more desirable.

Overall, however, due to the risks entailed in deployment within 200 mi of an international border, this area was not considered a reasonable alternative and was not selected for further study.

Arizona-New Mexico-SW Texas (Highlands) (Reference Figure A-5 p 5-31) (5.1.4.4)

Description

The suitable land in this area is more than 50 percent privately owned. It is composed of large valleys separated by mountains and is primarily semi-arid grassland and desert shrubland used for rangeland.

The rural population is reasonably low, but the area is accessible from Tucson, Arizona, and El Paso, Texas, via major highways.

Evaluation

The area is located from almost 400 to more than 600 mi from the coast (reasonable risks in western portion, not significant risks in eastern), but is less than 200 mi from the United States-Mexican border (unreasonable risk). Compatibility with M-X is considered reasonable.

The large percentage of privately held land would undoubtedly result in deployment of some shelters on land that is now private. To minimize the impact, siting actions would be required that would tend to increase M-X costs. Nonetheless, no insurmountable difficulties or impacts are anticipated that would cause an unreasonable rating on compatibility for this area.

Overall, due primarily to the risk entailed in deployment within 200 mi of an international border, this area was not considered a reasonable alternative and was not selected for further study.

West Texas/New Mexico (Southern High Plains) (Reference Figure A-6, p 5-32) (5.1.4.5)

Description

The suitable land in this area is 95 percent privately owned. It is composed primarily of relatively smooth plains, used for rangeland and crops such as wheat, cotton, barley, and rye.

The rural population is comparable to the other areas with the exception of Nevada/Utah. The northern portion of this area is not as densely populated, nor

does it contain as extensive a highway and secondary road network as the southern portion. However, taken as a whole, this area contains the greatest resident population of any of the candidate areas. The region is not likely to draw large numbers of visitors seeking recreation.

Evaluation

This area is located over 500 mi from the coast (no significant risks) and over 200 mi from the United States-Mexican border (reasonable risks). Compatibility with M-X is rated as reasonable, although there are some concerns.

Deployment would require private land acquisitions and land use restrictions as well as siting actions to minimize impacts on current activities. Sufficient rangeland suitable for M-X deployment apparently exists so that acquisition of agricultural land can be largely avoided. However, detailed studies will be required to determine the specific impact on agricultural productive land.

The rural population is within reasonable limits. Therefore, if agricultural land can be largely avoided, the verification and PLU operations affected by people and agricultural activities should not entail unreasonable risks. In fact, deployment of M-X on private land may enhance PLU because landowners may restrict transient traffic.

Verification, however, may suffer if deployment is in a plains area since the natural clustering advantage of valleys and mountains will be lost, and high confidence in post deployment inspection may require construction of artificial barriers.

Overall, while some potential risks and problems were identified, this area was considered a reasonable M-X basing area alternative. Therefore, in-depth environmental analysis has been directed for this area.

Colorado/Kansas/Nebraska (Central High Plains) (Reference Figure A-7, p 5-33) (5.1.4.6)

Description

The suitable land in this area is almost completely privately owned. It is composed of plains land, used predominately for raising crops such as wheat, sorghums, rye, and barley.

The rural population is comparable to the other candidate areas with the exception of Nevada/Utah. As determined by county figures, the population is evenly distributed. Although no major population centers are within or adjacent to the deployment area, a number of medium-sized towns and marketing centers are spread throughout the suitable lands, and the area is accessible by major highways. The area is not expected to draw a large number of visitors.

Evaluation

This area is located over 500 mi from the coast (no significant risks) and over 500 mi from an international border (no significant risks). However, as explained below, the local area and its activities are not reasonably compatible with M-X.

Basing in this area would be contrary to Congressional intent that M-X should be restricted to the least productive land available. Because the system would have to be deployed on cultivated land, impacts on agriculturally productive land could not be avoided--even with extensive siting actions to avoid acquisition of land with houses or facilities large enough to assemble or hide missiles. (Such facilities would be contrary to verfication principles.)

Operational costs would be increased by such siting actions, verification would be hampered by both the lack of natural valley clustering and ambiguous activities and facilities, and confidence in PLU with its security system and periodic sweeps would be more difficult and costly to maintain in a highly cultivated and active area.

An additional screening factor became evident during the evaluation of the Colorado-Kansas-Nebraska area. Because the prime system for M-X post-attack C^3 will rely on ALCC aircraft operating within 200 mi of the M-X field, other nearby targets were evaluated to assess how an attack on them would affect M-X operations.

Of the six potential basing areas, this area has, by far, the greatest number of high-value targets that the Soviets would most likely attack, including an adjacent Minuteman field, a Titan II field, NORAD Headquarters in Colorado Springs, and SAC Headquarters at Offutt AFB in Nebraska.

The large number of other targets near the potential M-X field will both constrain C^3 operations by limiting ALCC operating areas (or ground mobile control center operating areas) and provide the Soviets with a no-cost opportunity to reduce U.S. ICBM effectiveness through collateral damage effects. In view of the problems caused by other high-value targets in the area, the Colorado-Kansas-Nebraska area was judged to be the least operationally suitable of the potential basing areas.

For these reasons, this area was found to be an unreasonable alternative and worthy of consideration only if other basing areas prove to be impossible.

Summary Conclusions (5.1.4.7)

In general terms, operational difficulties and risks to M-X military effectiveness will be minimized by three basing provisions: deployment at a reasonable distance from the coast, deployment at a reasonable distance from international borders, and deployment in an area where M-X in MPS would be compatible with existing activities.

The California area was not selected for in-depth environmental analysis because it did not provide sufficient distance from the coast. The Western Arizona and Arizona-New Mexico-SW Texas areas were not selected for further study due to their proximity to an international border. The Colorado-Kansas-Nebraska area was not selected for further study because of incompatibility with M-X deployment and operational considerations.

In following the "horseshoe" pattern from Nevada/Utah, through California, Arizona, New Mexico, and Texas, to the Colorado-Kansas-Nebraska area, three

trends were evident: (1) The percentage of private land tends to increase; (2) lands tend to be predominately agricultural; and (3) population becomes relatively evenly distributed.

All three trends are indicative of increasing military and operational problems associated with M-X deployment. The problems can be overcome, but the difficulties will increase as one moves around the "horseshoe" until, in the Colorado-Kansas-Nebraska area, the concerns, combined with problems due to other nearby high-value targets, were sufficiently serious to decide not to select it for further study.

The two remaining areas, Nevada/Utah and West Texas/New Mexico, were both considered reasonable alternatives, although information collected to date indicates that Nevada/Utah is the preferred area for M-X in MPS.

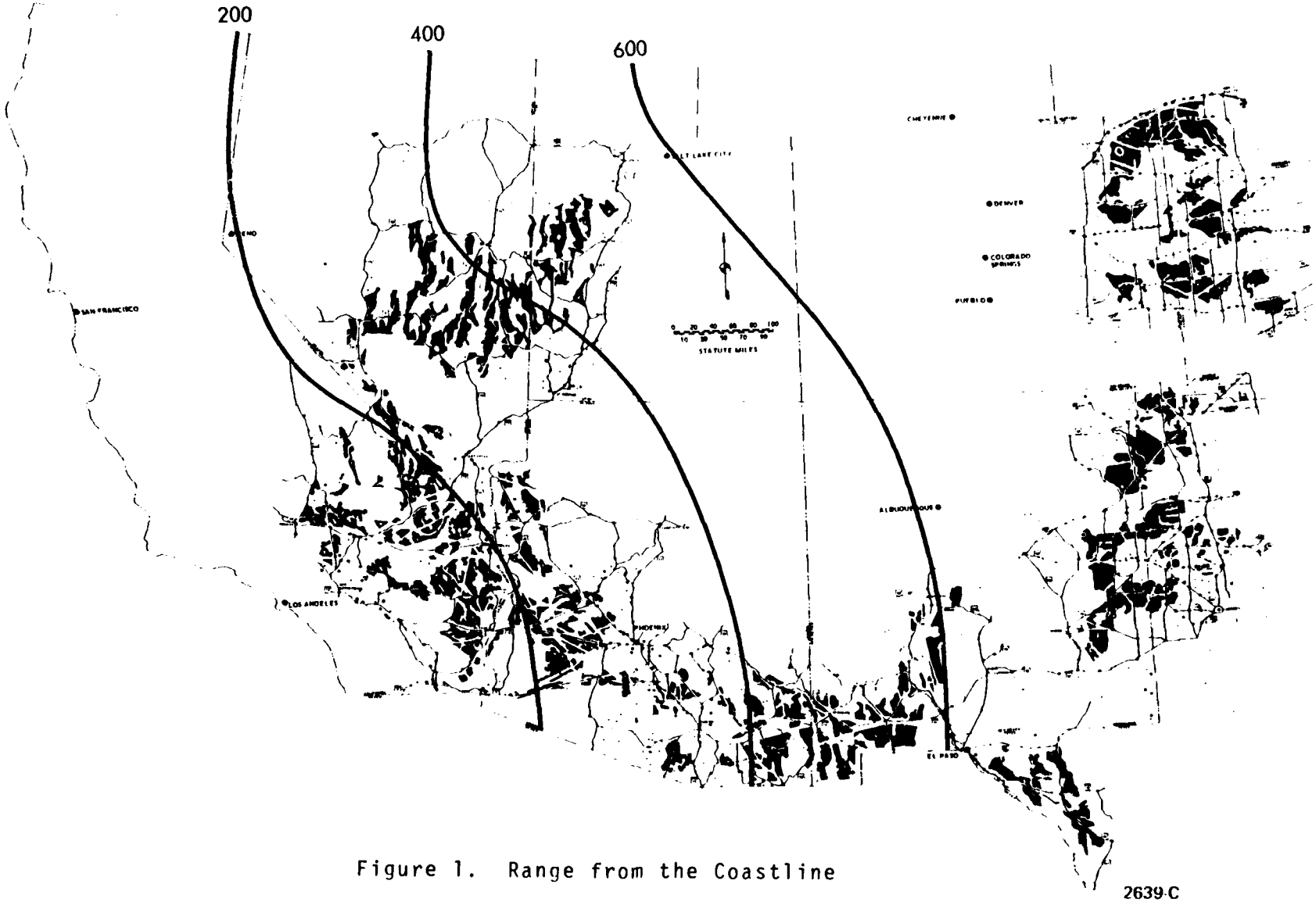

Figure 1. Range from the Coastline

Figure 2. Range from Borders and Coast

CHART 1. EVALUATION OF CANDIDATE BASING AREAS

CANDIDATE AREA	RISK DUE TO DISTANCE FROM COAST	RISK DUE TO DISTANCE FROM BORDER	COMPATIBILITY WITH LOCAL AREAS AND ACTIVITIES	SELECTED FOR FURTHER STUDY
Nevada-Utah	Reasonable	Not Significant	High	Yes
California	Unreasonable	Unreasonable in Southern Half	Reasonable	No
W. Arizona	Reasonable	Unreasonable	Reasonable	No
Arizona-New Mexico-SW Texas	Reasonable	Unreasonable	Reasonable	No
West Texas-New Mexico	Not Significant	Reasonable	Reasonable	Yes
Colorado-Kansas-Nebraska	Not Significant	Not Significant	Unreasonable	No

Description of Candidate Basing Areas

Appendix A

Areas within United States which can be considered for siting the M-X system have been determined through the screening process. The criteria employed during this process is summarized in Table I, p 5-26. The land areas remaining after application of screening criteria are called geotechnically suitable areas. They total about 83,000 mi^2 and are scattered throughout the southwestern portion of the country.

The land considered geotechnically suitable for M-X deployment is divided into the six candidate basing areas shown and depicted as the shaded area in Figure A-1, p 5-27. The candidate areas are identified as Nevada/Utah, California, Arizona, Arizona/New Mexico, Texas/New Mexico, and Colorado/Kansas/Nebraska. If a boundary were drawn around each of these areas, each candidate would encompass about 8,500 or more mi^2. This is sufficient land to accommodate a deployment of about 4,600 M-X shelters and associated facilities.

Figures A-2 through A-7, pp 5-28 through 5-33, show pertinent details of each of the six candidate basing areas. The specific geotechnically suitable land is shown as a shaded area on each map. Overlaid on the background of each map are county and state boundaries. Interstate, principal, and other major through-roads which traverse each area are also indicated. Cities and towns listed in Reference 1, p 5-25, are shown. Large dots indicate communities for which a population is recorded in either References 1 or 2. Small dots indicate communities for which no population is recorded in these two sources.

Table II, p 5-34, summarizes urban and rural population in the immediate vicinity of the basing areas. The adjacent urban population is determined by summing the population of all cities and towns whose center was within 5 mi of a shaded area. The rural population figures are gross estimates of the people living in the shaded areas on the maps and are determined as follows: The rural population in each affected county was computed by subtracting urban population from total population in Reference 3. Rural density throughout each county is then assumed to be the rural population divided by the area of the county from Reference 3. Finally, the rural population living on the shaded area in county is computed and then summed for the entire candidate-basing area.

There are some obvious oversimplications in this process. Rural population is not uniformly distributed throughout each county. This is true of Maricopa County in Arizona, which contains Phoenix, and in Nevada, which has mountainous areas. Also, it is likely that a significant fraction of the rural population resides within one mi of towns and major highways which are excluded from M-X siting. Nevertheless, it is a consistent computation process applied to each basing area and provides relevant comparative data. Figure A-8, p 5-34 shows these comparisons in bar-chart form.

REFERENCES

1. Rand-McNally Road Atlas, 1980.
2. "Population Estimates and Projections," Series P-25, Octobe 1979, Bureau of the Census.
3. County and City Data Book, 1977, Bureau of the Census.

Table I Siting Criteria

Areas exclusive of:

- All significant federal and state parks, monuments, forests, and grasslands; historic sites; game preserves and refuges; public lands set aside to preserve areas with unique recreational, historical, and natural values; and areas within one mile of their boundaries.
- Indian reservations and areas within one mile of their boundaries.
- Areas within five miles of international borders.
- Communities and areas within:

  20 miles of cities over 25,000 population
  3.5 miles of cities between 5,000 and 25,000
  1 mile of cities less than 5,000 population

- High potential economic resource areas, including oil and gas fields, strippable coal, oil shale and uranium deposits, and known geothermal resource areas, and areas within one mile of their boundaries.
- Industrial complexes such as active mining areas, tank farms, and pipeline complexes.
- Areas within one mile of major buried and surface electrical transmission lines ($\geq$115kV), communication lines, oil and gas pipelines (>4 inch diameter), state and federal paved highways, railroads, large energy or water conveyance projects, military bases, and missile sites.
- Areas with rock or water within 50 feet of the surface.
- Areas with slopes exceeding 10%, or otherwise unsuitable topography (numerous steep slopes, deep drainages, etc.).

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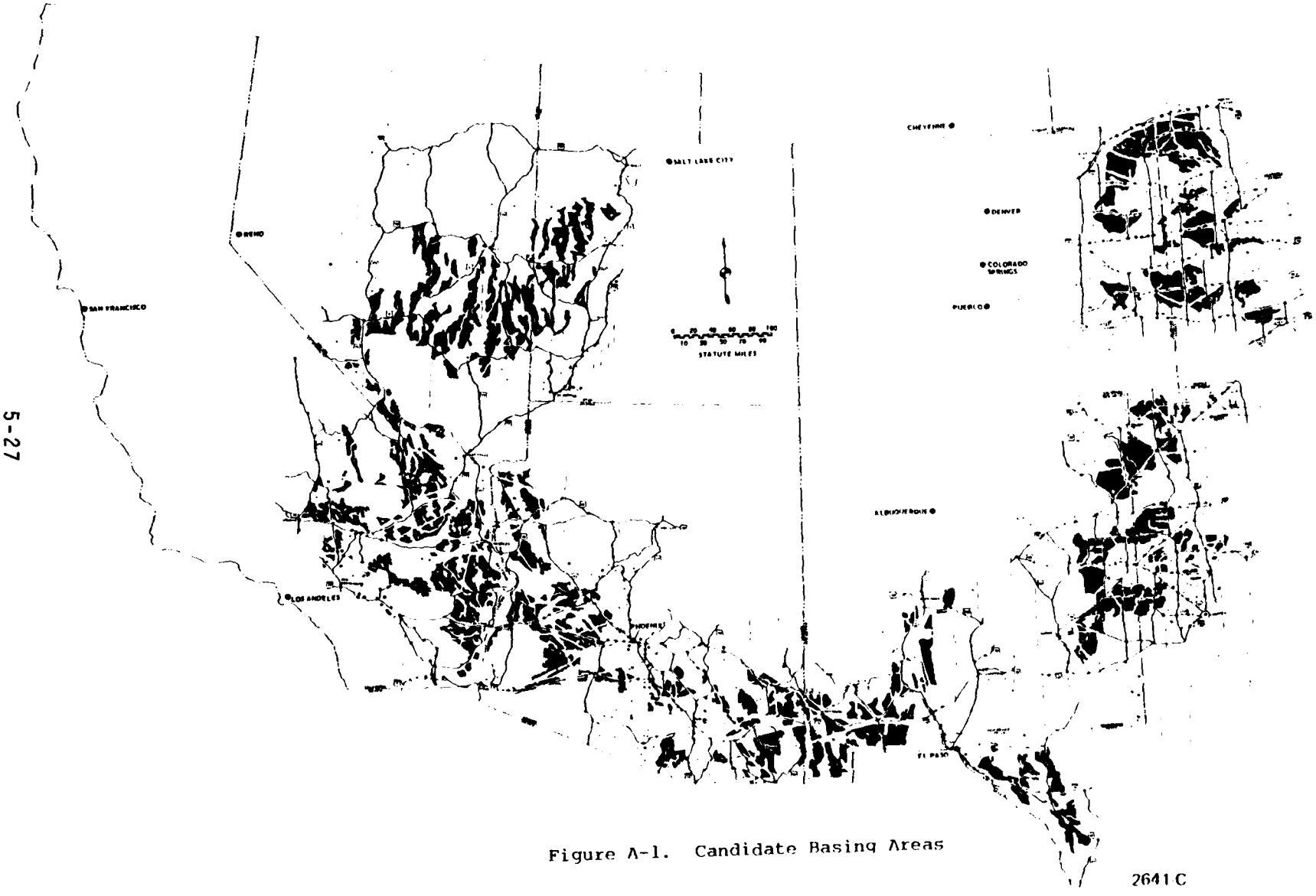

Figure A-1. Candidate Basing Areas

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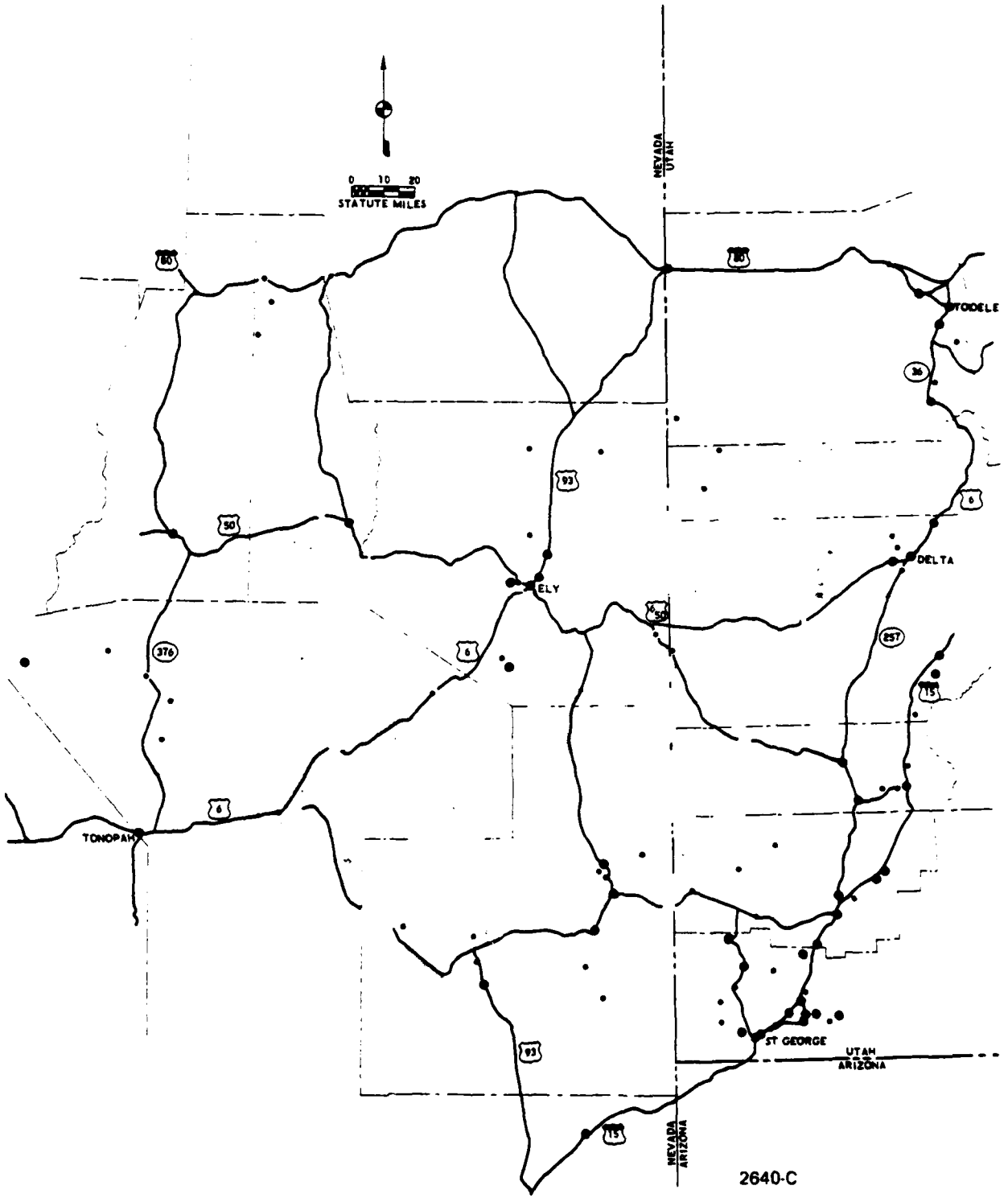

Figure A-2. Nevada-Utah Basing Area

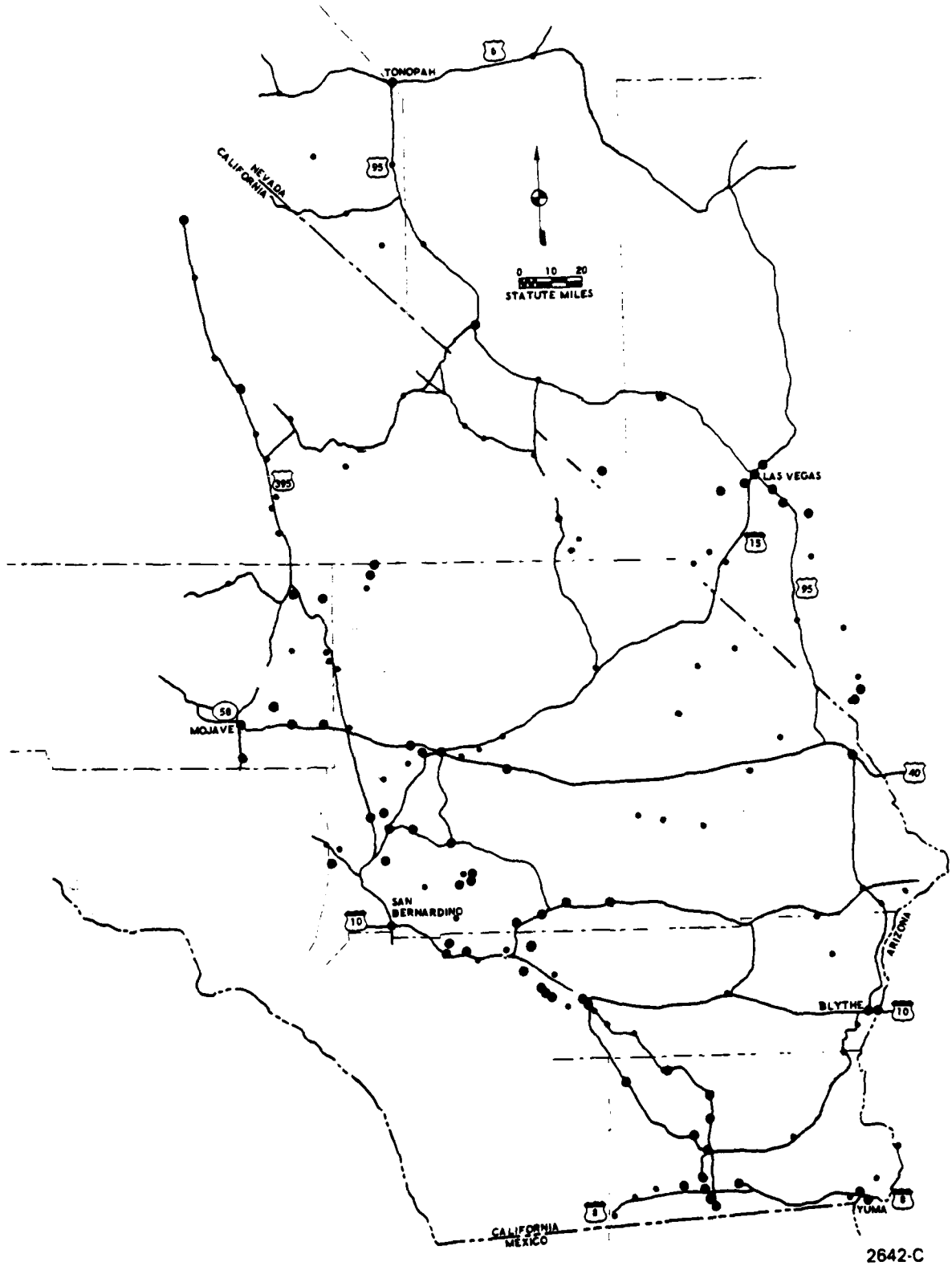

Figure A-3. California Basing Area

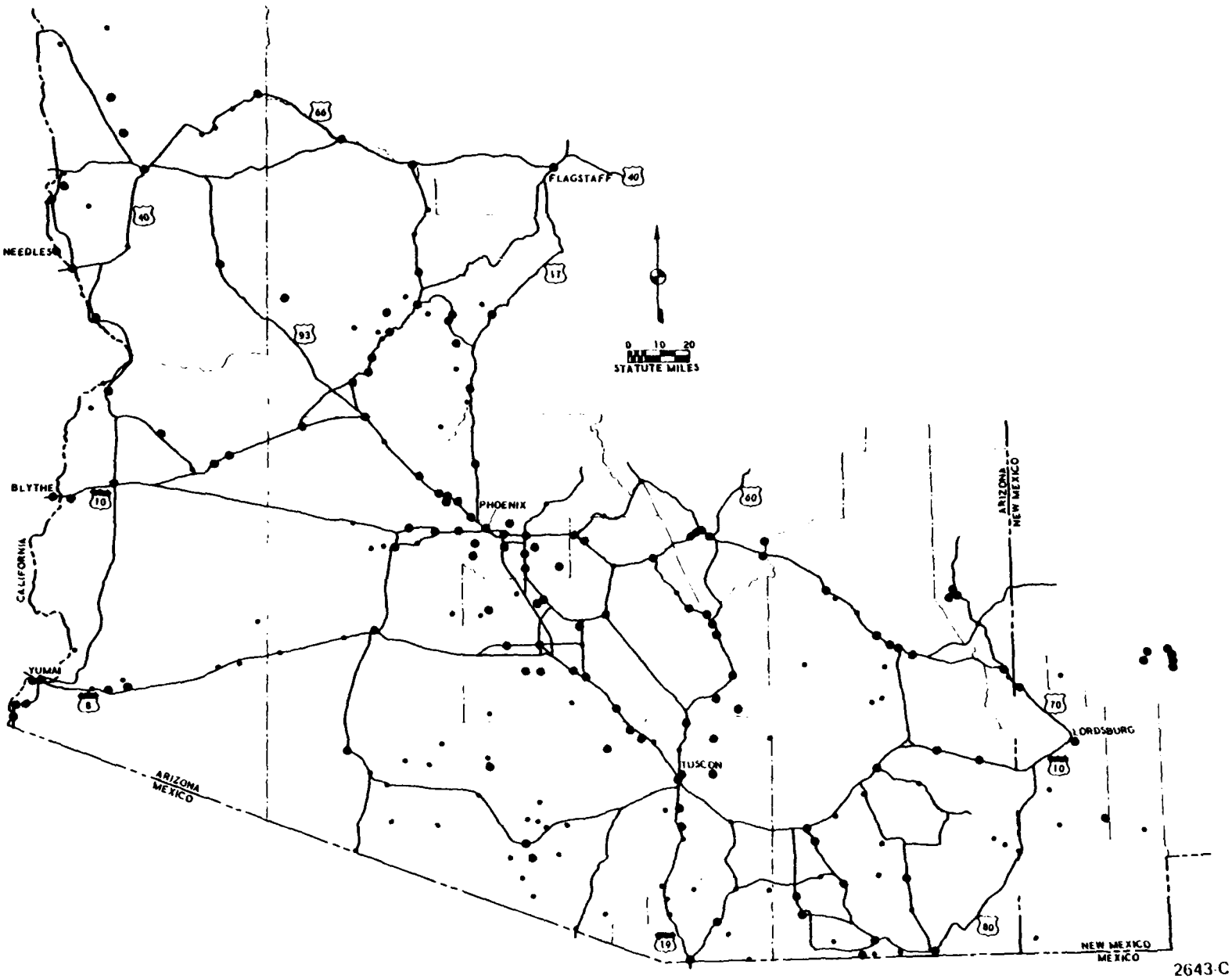

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Figure A-4. W. Arizona Basing Area

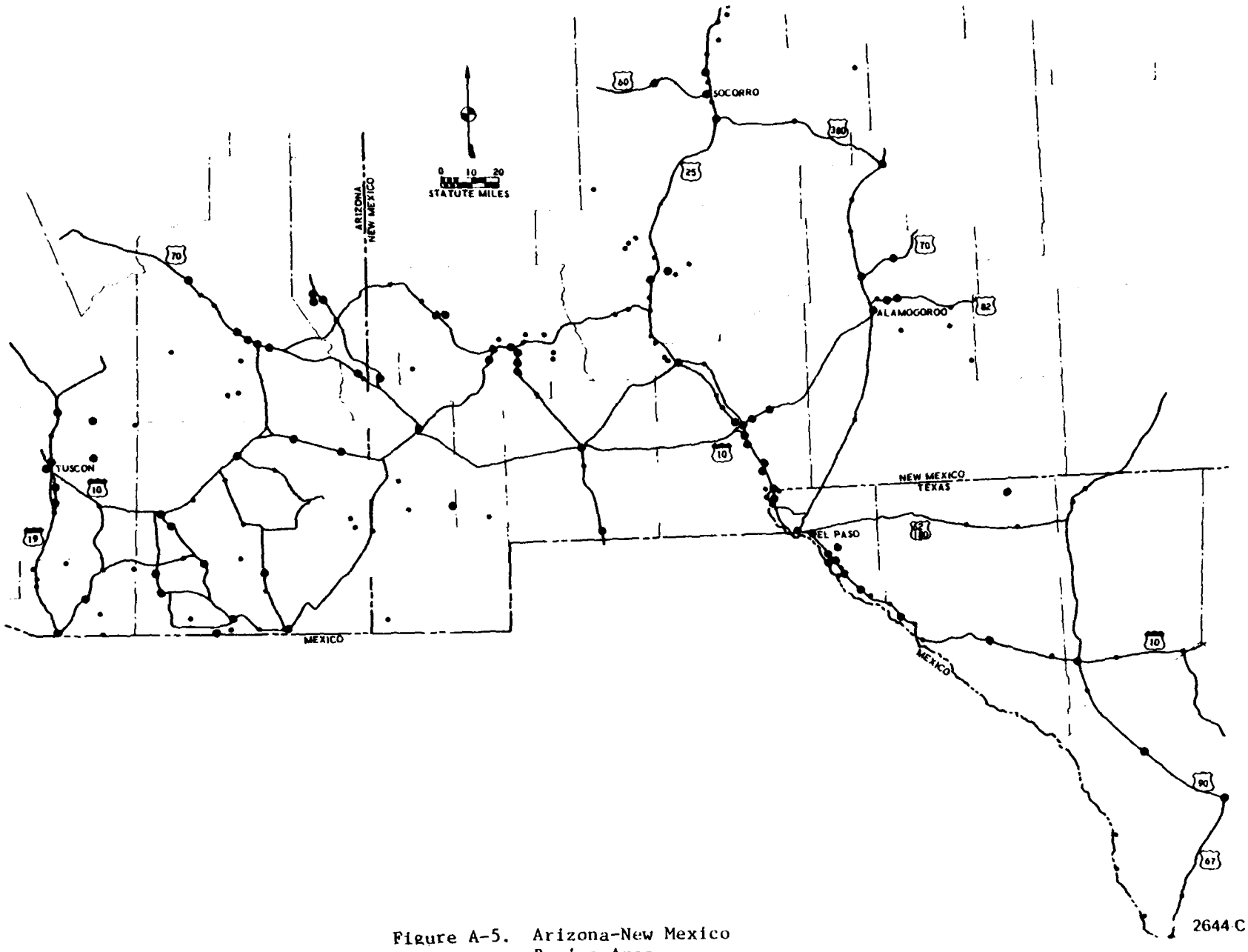

Figure A-5. Arizona-New Mexico Basing Area

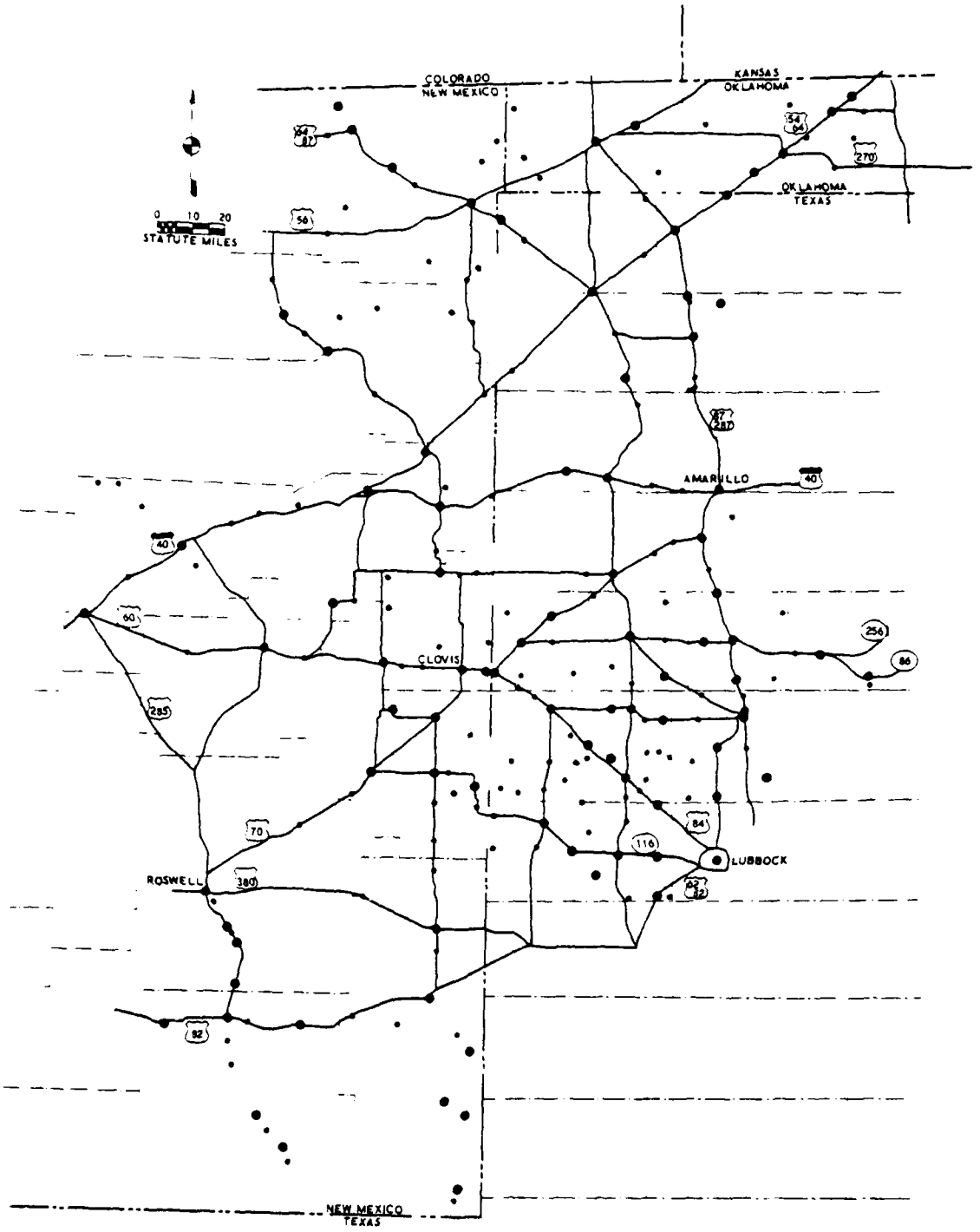

Figure A-6. West Texas-New Mexico Basing Area

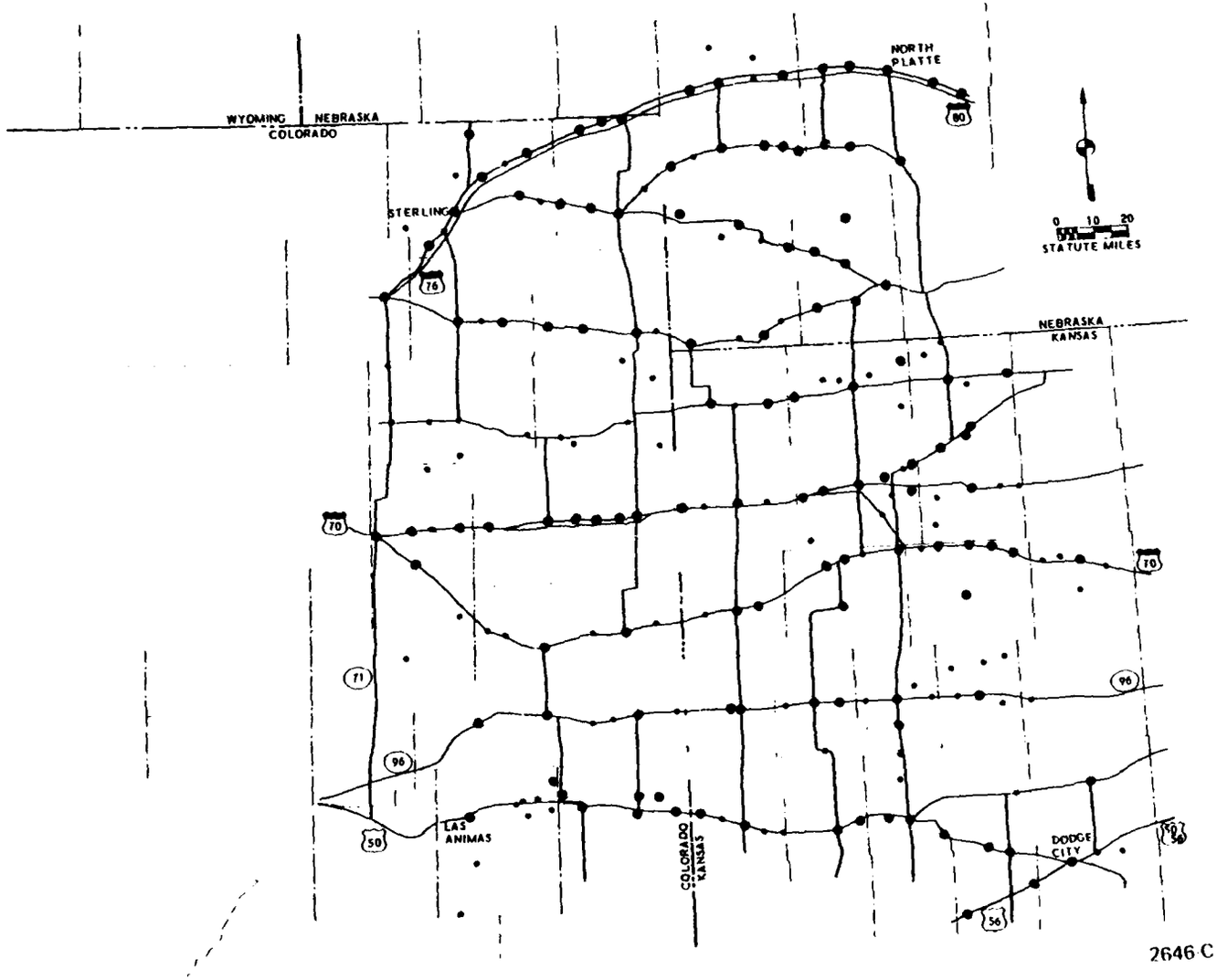

Figure A-7. Colorado-Kansas-Nebraska Basing Area

Table II. Population Within Basing Areas

Candidate Basing Area	Population	
	Urban[1]	Rural[2]
Nevada-Utah	4,922	1,215
California	51,811	21,980
Arizona	77,670	13,183
Arizona-New Mexico	57,361	9,449
New Mexico-Texas	83,921	15,504
Colorado-Kansas-Nebraska	55,479	15,123

[1] Towns within five miles of siting parcels

[2] Weighted rural density times 8,550 square miles

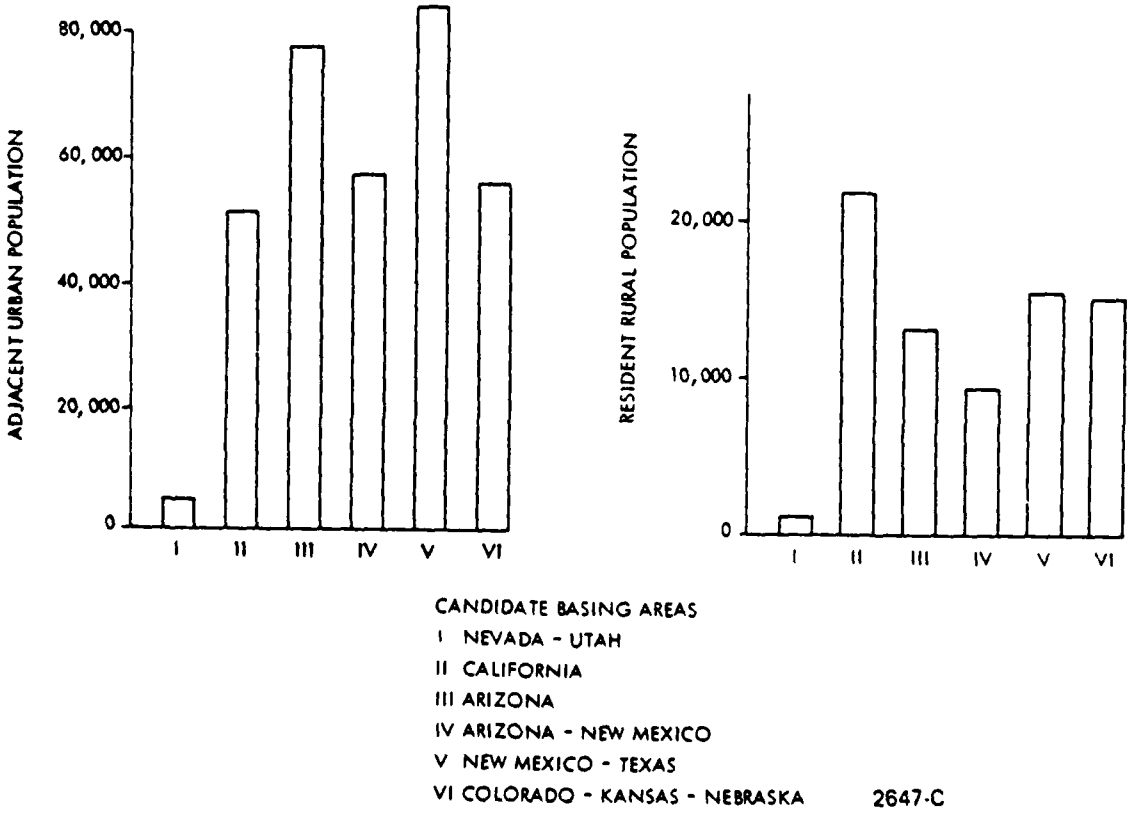

Figure A-8. Basing Area Population

5.2 GLOSSARY

5.2 GLOSSARY

Acre-Foot — The volume of water 1 foot deep, required to cover 1 acre (43,560 cubic feet).

Acquisition — Acquire by a lawful procedure (withdrawal), exchange, purchase or other means.

Adjudicate — To hear or try and determine judicially.

Aerobic — Pertaining to life, conditions, or activity requiring the presence of oxygen.

Aggregate Source — Gravel pit or rock quarry providing gravel for roads or concrete.

Airborne Launch Control Center (ALCC) — A specially-equipped aircraft that carries the necessary equipment and people to launch missiles upon proper direction.

Air Force Regional Civil Engineer - M-X (AFRCE-M-X) — The Air Force organization charged with planning and programming facility construction, including environmental studies. The AFRCE-M-X is co-located with and works in coordination with the Ballistic Missile Office.

Air Force Systems Command (AFSC) — The major Air Force command with responsibility for research and development activities. HQ AFSC is located at Andrews AFB, Maryland.

Air Quality Classes — Classes established by Congress in the Clean Air Act Amendments (1977) that define the amount of air pollution considered signifi-

cant within an area. Class I applies to areas where almost any change in air quality would be considered significant; Class II applies to areas where the deterioration normally accompanying moderate well-controlled growth would be considered insignificant; and Class III applies to areas where deterioration up to the national standards would be considered insignificant.

Air Quality Modeling

A quantitative technique of estimating the pollutant concentrations resulting from an emissions source.

Air Quality-Mandatory Class I Areas

Areas designated in the Clean Air Act Amendments (1977) where degradation of the ambient air quality is highly restricted. All international parks, national wilderness areas, and national memorial parks which exceed 5,000 acres in size and all national parks which exceed 6,000 acres in size are Mandatory Class I areas.

Alkali Flat

A level surface of land with a soluble salt or mixture of soluble salts present in the soil in such quantities as to be detrimental to agriculture.

Allotment Management Plan (AMP)

A livestock grazing management plan dealing with a specific unit of rangeland, based upon multiple use resource management objectives. The Allotment Management Plan (AMP) considers livestock grazing in relation to other uses of the range and in relationship to non-renewable resources (i.e., watershed, vegetation, wildlife, etc.). An AMP establishes the period of use, number of livestock and the range improvements needed for development.

Alluvial Fan

A fan-shaped landform made as a stream deposits material because of a change in the ability of the stream to transport sediment, such as when a stream leaves a narrow mountain canyon and enters a broad valley.

Alluvium

Clay, silt, sand, and gravel or other rock material transported by flowing water and deposited as sorted or semi-sorted sediments.

Ambient Air

Surrounding external or unconfined conditions; i.e., outdoor air.

American Indian Religious Freedom Act	Insures that Native Americans have an inherent right to free exercise of their religion.
Amphibian	Cold blooded, backboned, animals which have adapted to live in water and on land.
Animal Unit Month (AUM)	The amount of forage necessary for the subsistence of one cow or its equivalent for a period of one month.
Aquifer	A formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield significant quantities of water to wells and springs.
Arborescent	Resembling a tree in structure, growth, or appearance.
Archaic Period	Anthropological term indicating the oldest stage in the evolution of a particular culture.
Area of Analysis (AOA)	Community or county level geographic area.
Area Support Center (ASC)	A facility that will be used by personnel on duty in the deployment area. The facility will be used for sleeping, eating, and recreation.
Assembly and Checkout (A&CO)	The phase of the M-X program following construction of the facilities. This phase includes equipment installation and testing of the component parts.
Atmospheric Dispersion	The transport and diffusion of gaseous and particulate matter in the atmosphere resulting from winds and turbulent mixing.
Aufwuch	Invertebrates and micro algae that reside on the surface of emergent aquatic vegetation.
Avian	Pertaining to birds.
Avifauna	The birds of a region, period, or environment.
Bajada	An alluvial plain formed at the base of a range of mountains by the coalescing of several alluvial fans.
Ballistic Missile Office (BMO)	The Air Force organization responsible for the design, development, and acquisition of ballistic missile systems. The BMO is located at Norton AFB, California.

Barrier	An earth mound that closes access between the designated transportation network and a cluster.
Baseline Particulates	The ambient suspended particulate level in a region that is determined to exist as of a specified date. Used to determine increment consumption and NAAQS violations.
Benthic Macroinvertebrates	Crustaceans and mollusks residing in bottom sediments of aquatic habitats.
Berm	A mound of compacted earth over a horizontal protective structure.
Bifurcate	To divide into two parts.
Biomass	The weight of living or once-living material in all or part of an organism, population, or community. Commonly expressed as weight per unit area, a biomass density.
Biota	The flora and fauna of a region.
Borrow Pit	An area where material (soil, rock, sand, gravel) is excavated for use as fill, roadbed material, concrete, etc. at another location.
Brecciated	Made of highly angular coarse fragments; such rocks may be sedimentary or formed by crushing or grinding along faults.
Caliche	A calcium carbonate deposit formed in the surface rocks of arid regions.
Canister	A cylindrical tube that houses and protects the missile, and includes a system for propelling the missile upward approximately 100 ft before the first stage motor ignites.
Cast-in-Place Construction	A technique involving the complete fabrication of the protective structures at the construction site itself.
Cenozoic	An era in geological history extending from the beginning of the Tertiary period to the present time, characterized by the rapid evolution of mammals, birds, grasses, shrubs, and higher flowering plants.
Chaining	A method to remove vegetation by dragging a chain attached between two bulldozers.

Class II Cultural Resource Inventory	An intensive archaeological survey of a part of a large study area.
Clastic	Consisting of fragments of rocks or of organic structures that have been moved individually from their places of origin.
Clean Air Act	An act for air pollution prevention and control: (1) to protect and enhance public health and welfare and the productive capacity of its population, (2) to initiate and accelerate a national research and development program to control air pollution, (3) to provide technical and financial assistance to state and local governments in connection with the development and execution of their air pol-lution prevention and control programs, (4) to encourage and assist the development and operation of regional air pollution control programs. 1977 Amendments to the CAA include PSD regulations.
Climatic Parameters	Measures of the nature of the climate (e.g., temperature, relative humidity, etc.).
Climax Community	The last and most stable of a series of communities in a succession, remaining relatively unchanged as long as climatic and physiographic factors remain constant.
Climax Species	The species known to occur in a plant community that is relatively stable with respect to species composition and vegetative structure.
Clinometer	An instrument for measuring heights and angles.
Closed Basin	The depressed topographic feature in which water can run by means of surface drainage, but from which there is no surface outlet.
Cluster	A group of 23 protective structures and a cluster maintenance facility, connected by roads but isolated from the designated transportation network by a barrier.
Cluster Maintenance Facility (CMF)	A secure building and related facilities for a missile transfer, and maintenance and repair of equipment not requiring return to the designated assembly area.

Cluster Roads — Unpaved roads providing access to the protective structures and cluster maintenance facility.

Cohort — Member of a biological population from the same generation.

Command, Control, and Communications (C^3) — The system of people, procedures, and equipment that monitors the status and controls the use of weapons systems.

Concurrent Construction — A method in which construction is begun in three or four areas spread throughout the designated deployment area and is continued simultaneously until the system is complete.

Crest Rounding — The smoothing off by erosion of the highest natural projections crowning a hill or mountain.

Cretaceous — The final period of the Mesozoic era lasting from about 70 to 140 million years ago, characterized by the division of mammals into placentals, marsupials, and monotremes, and by the development of specialized reptiles.

Critical Wildlife Habitat — Habitat that is necessary to sustain the existence and/or perpetuation of a species at critical periods during its life cycle.

Crown Cover — The surface area intercepted by a vertical line dropped from the periphery of the canopy or crown of a plant.

Crown Diameter — Diameter of the leaf bearing portion of a tree.

Cultural Resource — Nonrenewable remains of human activities, occupations, and endeavors as reflected in sites, buildings, structures, or objects, including works of art, architecture, and engineering. Cultural resources are commonly discussed as prehistoric and historic values, but each period represents a part of the full continuum of cultural values from the earliest to the most recent.

Debris Slope — The base of an eroded slope characterized by rock fall and accumulations of fragments of weathered rocks.

Deme	A local breeding population.
Depauperate	Poor species diversity.
Deployment	Putting into service.
Desert Pavement	A relatively thin, fragile surface deposit on alluvial fans in desert regions, consisting of pebble-to cobble-sized rocks from which all fine material has been removed by wind erosion.
Decommissioning	To remove or take out of service.
Demographics	Characteristics of human populations such as size, growth, density, distribution, and vital statistics.
Designated	Areas where groundwater depletions have caused future diversions to be subject to special regulation by the state engineer. Permits to pump groundwater are (1) not being issued, (2) being issued with limitations, (3) being issued for preferred users only.
Designated Assembly Area (DAA)	A high-security area that includes facilities for missile and canister assembly; munitions storage; build-up, teardown, and repair of reentry systems and components; storage of complete canisterized missiles and necessary spares; other functions necessary for missile assembly and repair; and initial build-up of transporter and launcher subassemblies.
Designated Deployment Area (DDA)	The actual geographical territory in which M-X missiles are deployed. An identifiable area containing clusters of protective structures, area support centers, cluster maintenance facilities, power facilities, and remote surveillance sites.
Designated Transportation Network (DTN)	A special paved road system that provides the only means for transporting canisterized missiles and launchers between the designated assembly area and the clusters.
Diffusion Field	The air turbulence throughout a three-dimensional field.

Discing	Procedural stage in soil tillage and crop planting involving the breaking up of clods resulting from the initial ploughing by knife discs mounted on a transverse frame pulled by a tractor.
Dissection	The work of erosion in destroying the continuity of a relatively even surface by cutting ravines or valleys into it.
Diurnal	Active during daylight hours.
Draft Environmental Impact Statement (DEIS)	A draft version of the statement of environmental effects of a project which is published for review and response by federal, state, local agencies, any affected Indian tribe, the proponent of the action and any other interested persons (including those who might not be in accord with the action on environmental grounds).
Easement	A nonprofitable interest in land owned by another that entitles its holder to a specific limited use.
Econometrics	The use of sophisticated mathematical, statistical, and other analytic methods to make quantitative economic analyses.
Edaphic	Influenced by soil characteristics rather than other possible inputs such as climate or water.
Endangered Species	Any animal or plant species in danger of extinction throughout all or a significant portion of its range.
Endangered Species Act	Provides a means whereby ecosystems upon which endangered species and threatened species depend may be conserved; provides a program for the conservation of such endangered and threatened species.
Eocene	The second epoch of the Tertiary period characterized by the rise of modern mammals and lasting from perhaps 45 to 70 million years ago.
Epeirogeny	Uplift or depression of land masses as a result of widespread level adjustments. Epeirogenic movements are primarily even in character, producing tilting, warping, and minor faulting of the rocks.

Ephemeral Stream	In areas where precipitation almost totally consists of rainfall, a short-lived stream which follows natural ground surface contours after each storm and dries out until the next rainfall.
Erosion	Wearing away by action of water or wind or other means.
Escarpment	A steep slope separating two or more gently sloping surfaces.
Ethanol	Grain alcohol.
Ethnographic Properties	Districts, sites, biota, inorganic materials, and other features of the natural environment which are of cultural value and importance to Native Americans for traditional and religious activity.
Eutrophic	Pertaining to a lake, usually shallow, rich in dissolved nutrients but with a minimal amount of oxygen.
Evaporite	A sediment resulting from the evaporation of saline water.
Evapotranspiration	The process of transferring moisture from the earth to the atmosphere by transpiration (emitting watery vapor) from plants.
Extant	Currently in existence.
Faulting	The movement that produces relative displacement of adjacent rock masses along a fracture.
Fault Scarp	An escarpment, cliff, or steep slope produced by a fault; relative recency is implied with small faults because of erosional exposure.
Fauna	Animals or animal life.
Federal Land Policy and Management Act	Declaration of policy regarding planning, management, and dispositions of public lands.
Feral	Untamed, undomesticated, wild.
Final Operational Capability (FOC)	A point in time when all 200 missiles of the M-X system are on alert and operational.

Floodplain	A level tract of land bordering rivers and formed by alluvial deposits that may be submerged by overflowing river water.
Flora	Plant life.
Floristic Zone	The spatial quality of a plant community.
Fluted Projectile Points	Arrowheads whose flaking is characteristic of Upper Paleolithic times.
Fluvial	Of or pertaining to a river; produced by the action of a stream or river; existing, growing, or living in or about a stream or river.
Fly Ash	Fine solid particles of noncombustible ash produced when solid fuels (e.g., coal) are burned. (For example, ash collected from a power plant stack.)
Forb	Broad-leafed, non-woody plant.
Formalin	A water-based solution of formaldehyde; a preservative.
Fossil Fuels	Coal, oil, natural gas, and other fuels originating from fossilized geologic deposits and depending on oxidation for release of energy.
Friable	Easily pulverized or crumbled.
Fugitive dust	A type of particulate emission mode airborne by forces of wind or man's activity, such as unpaved roads, construction sites, tilled land or windstorms.
Genetic Drift	Divergence of genotype in populations of the same species from one generation to the next, usually as a result of geographic isolation.
Genotype	Genetic or hereditary character of an organism.
Geodetic	The science of treating the critical measurement of the earth, including relief, configuration of continents and ocean basins, etc.
Geodetic Triangulation	Closely controlled terrain surveying which locates lines and points based on geometric relationships of polygonal distances and included angles. (Modern surveys use electronic distance measuring equipment and laser beams.)

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Geomorphic	Pertaining to the core of the earth's interior.
Geotechnically Suitable	Satisfies such criteria as depth to water, depth to rock, topography etc.
Glaciofluvial	Joint ice-flow, meltwater, and stream activity, such as in the deposition of sediments.
Grazing Permit	A document authorizing use of public lands for the purpose of grazing livestock.
Gravity Model	A model for estimating the relative attractivity of particular communities and towns. Variables include community site, distance from project site, and the generated employment. It is used to determine the spatial allocation of project workers and their families.
Groundwater	Underground water supplying wells and springs.
Groundwater Recharge	The process whereby water is fed back into the groundwater system.
Habitat	The natural home or dwelling place of an organism.
Halogeton	A weed toxic to livestock.
Halophytes	Plants having a high level of salt tolerance.
Hardpan	A layer of strongly cemented and often clayey material that is impenetrable by roots and restricts the downward percolation of rainwater.
Hertz	A measurement of frequency; 1 cycle/second.
Herpetofauna	A list of reptiles and amphibians for a given area.
Historic Properties	Districts, sites, structures, objects, and other evidence of human use considered to be of cultural value and importance to Native Americans for traditional, religious, curatorial, and other reasons; may be eligible for nomination to the National Register of Historic Places.

Herbivore	A primary consumer of green plants.
Holocene	The most recent period in geological history, beginning about 25,000 years ago, marked by the rise of Homo sapiens.
Hydration	To cause to take up or combine with water.
Hydraulic Conductivity	Ease with which a material transmits water.
Hydrographic Area	A region wholly or partially surrounded by topographic barriers and comprised of watersheds which drain to a common point, either to an interior basin or to an adjoining hydrographic area.
Hydrology	The study of seas, lakes, rivers, and other bodies of water.
Igneous Rocks	Resulting from the solidification of molten magma, igneous rocks are regarded as the primary source of material comprising the earth's surface.
Indurated	Hardened.
Inert Emissions	Air pollutant emissions whose chemical form is not altered by chemical reactions with other chemical species.
Infrastructure	Facilities and services necessary for the general welfare of the community, such as education, health care, police and fire protection, water supply, wastewater treatment, solid waste disposal, and provisions for parks and recreation areas.
Initial Operational Capability (IOC)	The point in time when ten M-X missiles are on alert and operational.
In-migration	Movement of population into a community or region.
Intercontinental Ballistic Missile (ICBM)	A large land-based missile capable of accurate delivery over intercontinental ranges (usually greater than 5,000 mi).
Interior Drainage	(a) Surface drainage whereby the water does not reach the ocean, such as draining toward the lowermost or central part of an interior basin. It is common in arid and semi-arid regions. (b) A drainage pattern

	wherein streams disappear by evaporation and percolation into their beds and playas, and fail to reach the sea.
Intermontane	Lying between mountains.
Intrusives	Igneous rocks which, while fluid, were intruded into or between other rocks, and solidified before reaching the surface.
Invertebrate	Animal without a spinal column.
Jurassic	A period of the Mesozoic era, lasting from 140 to 170 million years ago, marked by the appearance of the earliest birds, the modern fishes, and the peak of reptile development.
Kilovolt (KV)	The electromotive unit of force equal to 1,000 volts.
Kilowatt (KW)	One thousand watts.
Kilowatt-hour (KWH)	A basic unit of electrical energy which equals 1 kilowatt of power applied for 1 hour.
Lacustrine	Pertaining to, produced by, or formed in a lake or lakes; growing in or inhabiting lakes; characterized by lakes or lakebeds.
Lagomorph	Any gnawing mammal of the order Lagomorpha, principally rabbits, hares, and pikas.
LANDSAT	Land satellite, or a series of unmanned spacecraft designed to collect earth resources data on a repetitive basis to be used by planners, scientists, and decision makers.
Leachate	Liquid solution containing dissolved elements or groups of elements formed by flow through (or around) a solid medium such as soil.
Lithic Scatter	Archaeologist's term for chips of rock thought to have resulted from human tool making.
Littoral	(a) Pertaining to the seashore, especially the region between tide lines. (b) In lakes,

	pertaining to the region between the shoreline and the outer limit of rooted plants.
Loam	A soil consisting of a mixture of clay, silt, and sand in roughly equal proportions.
Lugols Solution	A water-based preservative for plytoplankton containing potassium, iodine and glacial acetic acid.
Macro-Econometrics	The study of an entire economic system using econometric techniques.
Mass Simulator	A device that duplicates the weight, balance, and other characteristics of the launcher, used to minimize the possibility that the location of the launcher can be detected by any known means.
Megawatt (MW)	One million watts or 1 thousand kilowatts.
Mesozoic	An era in geological history ranging in time from 70 to 230 million years, characterized by the development of reptiles.
Meterology	Science of the atmosphere.
Microbial	Pertaining to microorganisms, or germs.
Micro-Econometrics	The study of individual portions of an economic system using econometric techniques.
Microphyllous	Small leaved plants.
Milestone	A point in time in a schedule when a specified action is to be completed or taken.
Milestone I	A major decision point in the acquisition of an Air Force weapons system in which activities move from the conceptual to the validation phase.
Milestone II	A major decision point in the acquisition of an Air Force weapons system in which activities move from the validation to the full scale engineering development phase.
Milestone III	A major decision point in the acquisition of an Air Force weapons system in which activities move from the full scale engineering to the production/deployment phase.

Miocene

An epoch of the Tertiary period, 15 to 35 million years ago, marked by the development of apes and the appearance of ancestral gibbons.

Mitigation

Any of the following: (1) avoiding the impact altogether by not taking an action or part of an action; (2) minimizing impacts by limiting the degree or magnitude of the action and its implementation; (3) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; (4) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; (5) compensating for the impact by replacing or providing substitute resources or environments.

Mixing Heights

The height of the well-mixed atmospheric layer beneath a stable layer.

Mollisols

Soils that have nearly black, loosely packed, organic rich surface layers high in bases (i.e. calcium, magnesium).

Morphology

A branch of biology dealing with form and structure.

Multiple Protective Structure (MPS)

A survivable deployment method for ICBMs in which the missile and its essential launch equipment are mobile, and can be emplaced in any of a number of protective structures in such a way that its location is unknown and remains undetectable; it maintains strategic deterrence and unacceptable targetting problem.

Multiplier

Indicates an outcome which is larger than the initial stimulus. For example, direct employment in an area will stimulate indirect employment as local suppliers respond to direct worker needs. In this case, total employment is a "multiple" of the initial direct stimulus.

National Ambient Air Quality Standards (NAAQS)

The allowable concentrations of air pollutants in the air ambient specified by the federal government for SO_2, TSP, NO_x, HC, O_3, and CO. The ambient air quality standards are divided into primary standards (based on the air quality criteria and allowing an adequate margin of safety, the primary standards are requisite to pro-

tect the public health) and secondary standards (based on the air quality criteria and allowing an adequate margin of safety, the secondary standards are requisite to protect the public welfare from any known or anticipated adverse effects associated with the presence of air pollutants in the ambient air).

National Environmental Policy Act (NEPA)

An act to declare a national policy which will encourage productive and enjoyable harmony between man and man's environment, to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man, to enrich the understanding of the ecological systems and natural resources important to the nation, and to establish a Council on Environmental Quality (CEQ).

National Historic Preservation Act of 1966

An act that declares a national policy of historic preservation including the encouragement of preservation on the state and private levels.

National Register of Historic Places

A list of districts, sites, buildings, structures, and objects significant in American history, architecture, archaeology, and culture, maintained by the Secretary of the Interior.

National Technical Means

Methods available to the U.S. and the Soviet Union to verify that the other party is complying with strategic arms limitation agreements, in a manner consistent with generally recognized principles of international law (e.g., by satellite observation).

Neoindian

Anthropologic term indicating the "new" or relatively recent Indian periods.

Nitrogen Oxides (NO_x)

Compounds produced by combustion, particularly when there is an excess of air or when combustion temperatures are very high. Nitrogen oxides are primary air pollutants.

Nocturnal Radiation Inversion

The cooling of the earth's surface at night resulting in a layer of air where the temperature increases with height.

Nonattainment Area — An area already characterized by significant levels of air pollution. Such areas are restrictive of any significant increases in certain pollutants caused by new sources (industrial or powerplant).

Off-Road Vehicle (ORV) — A vehicle (including four wheel drive, trail bikes, hovercraft, snow mobiles, etc., but excluding helicopters, fixed wing aircraft and boats) capable of travelling off roads over land, water, ice, snow, sand, marshes, etc.

Oligocene — An epoch in the Tertiary period of the Cenozoic era some 35 to 45 million years ago which gave rise to the early apes in Egypt and to the ancestors of Old World monkeys. It follows the Eocene epoch.

Opacity — The degree to which emissions reduce the transmission of light and obscure the view of an object in the background. A state which renders material partially or wholly impervious to rays of light and causes obstruction of an observer's view.

Operational Base Test Site (OBTS) — A small, separate group of shelters used for testing equipment and techniques.

Operations Control Center (OCC) — The hub of all command control activities for the missile unit. It includes offices and all facilities required for control and monitoring of missile status, and for control of maintenance, security, and transportation activities. An OCC will be located at each operating base.

Out-migration — Movement of population out of a community or region.

Overburden — The earth, rock, and other materials that lie above a mineral deposit.

Overdraft — Groundwater withdrawals exceeding estimated perennial yields.

Paleoindian Period — Anthropologic term indicating the earliest ancient Indian time of the history of human beings in North America.

Palentology — A science that deals with the life of past geological periods and is based on the study of fossil remains of plants and animals.

Paleozoic	An era in geological history marked by the culmination of almost all invertebrates except the insects, and the first appearance of land plants, amphibians, and reptiles in its later epochs. It lasted from perhaps 230 to 600 million years ago.
Particulate Matter	Any material, except water in a chemically uncombined form, that is or has been airborne and exists as a liquid or a solid at standard temperature and pressure conditions (for example, minute particles of coal dust, fly ash, and oxides temporarily suspended in the atmosphere).
Pediment	A plain of eroded bedrock in an arid region developed between mountain and basin areas.
Pedogenic Horizon	Soil horizon; a layer of soil parallel to the land surface and differing from adjacent layers in such characteristics as color, texture, chemistry, and structure.
Pedologic	Pertaining to soil science.
Perched Water	Groundwater separated from an underlying body of groundwater by unsaturated rock.
Perennial	Present throughout the year.
Perennial Yield	The maximum amount of groundwater that can be salvaged each year over the long term without depleting the groundwater reservoir. Perennial yield cannot be more than the natural recharge to a groundwater basin.
Periphyton	The organisms adhering to submerged vegetation.
Permeability	The property of capacity of a porous rock, sediment, or soil for transmitting a fluid without impairment of the structure of the medium; it is a measure of the relative ease of fluid flow under unequal pressure.
Petroglyph	A carving or inscription on a rock.
pH	A scale indicating the type of ionic character (i.e. acidity and alkalinity)
Phenology	A term used to describe the sequence of events and time of occurrence of the life

	processes of a plant, i.e., start of growth, bloom stage, seed ripe, or dormant stage.
Phreatophyte	Vegetation with roots reaching to the water table.
Physical Security System	Provides protection for M-X elements against unauthorized access or acquisition.
Phytoplankton	The plant organisms of plankton.
Phytosociological	The branch of ecology concerned with the interrelationships of the flora of particular areas.
Pictograph	An ancient or prehistoric drawing or painting on a rock wall.
Pilocene	The final Tertiary epoch lasting from about 15 million years before and ending with the Pleistocene period, in which prehuman levels were reached and apes of modern types appeared.
Plasticity	A term used in soil mechanics to indicate a stage of soil consistency between a semi-solid and a liquid state as affected by the water content.
Playa	A flat plain relatively free of vegetation on which flood waters may create a lake.
Pleistocene	The last million years of geological history, lasting from 500,000 to 1,000,000 years, marked by repeated glaciation and the first indication of social life in human beings.
Pluvial	Of or relating to rain.
Position Location Uncertainty	The concept, equipment, and procedures that prevent unauthorized people from knowing or determining the location of operational missiles.
Precast Construction	A method in which individual sections of the protective structures are fabricated at a centrally located plant, delivered to protective structure locations by truck, and assembled at the site.
Predator	A secondary/tertiary consumer of herbivore or carnivores.

Prevention of Significant Deterioration Regulations	Regulations from EPA intended to protect clean air areas from degradation. Three area classes (I, II, III) are provided which permit minimal, moderate and maximum increments of degration. The NAAQS may not be exceeded.
Protected Species	Plants or animals which have state or federal legal status. The categories of threatened and endangered are associated with protected species.
Protective Structure	A structure that can house and protect an ICBM from nuclear blast and radiation.
Quaternary	A period in geological history lasting from the end of the Tertiary period to the present time, characterized by the rise of the present mammalian genera.
Radiation Inversion	A layer of the atmosphere where temperature increases with increasing height as the result of nocturnal radiative cooling.
Rail Spur	A secondary line from a railroad leading to a point where supplies are delivered.
Raptor	Pertaining to a bird of prey.
Reactive Emissions	Air pollutant emissions whose chemical form may be altered by chemical reactions with other chemical species.
Rebar	Steel reinforcing bars, designed for embedment in concrete.
Recharging Playa	A playa which supplies water for groundwater recharge.
Remote Surveillance Site (RSS)	A site with tower-mounted radar and day/night optical equipment for surveillance of clusters, roads, and the surrounding areas. It is normally unmanned.
Revegetation	Reestablishment of vegetation in disturbed areas.
Riparian	Pertaining to or situated on the banks of a body of water, or wherever the water table comes into close proximity with the land surface.

Riparian Woodland	Vegetation communities associated with water, especially flowing water.
Saline	Consisting of or containing salt.
Safe Water Drinking Act	Applies to public water systems; specifies the maximum contaminant levels which are requisite to protect the public welfare.
Sampling Universe	Entire set of objects under study.
Scarify	Breaking or cutting the surface soil.
Scatter Zone	Brecciated zone surrounding an intrusive body in which the minerals have been assimilated into the surrounding rock.
Scoping Process	An early and open process for determining the scope of issues to be addressed in an environmental impact statement, and for identifying the significant issues related to a Proposed Action.
Scour	Erosion, especially by moving water.
Sequential Construction	A method in which work is first begun on those portions of the M-X system nearest the operating base/designated assembly area and then is progressively extended outward until all facilities are completed.
Shear Zone	A zone of structural debilitation in the rocks usually located within or proximal to fault zones.
Silicified	Original material replaced by silica in such a manner that the original form and structure of the silicified object is preserved.
Sodic	A soil containing sufficient exchangeable sodium to interfere with the growth of most crop plants and cause the soil colloids to disperse and lose structure.
Soil Horizon	A layer of soil approximately parallel to the land surface and differing from adjacent layers in such characteristics as color, texture, chemistry, and structure.
Soil Signature	A characteristic or combination of characteristics by which a soil may be identified on an image or photograph.

Spectral Signature	A characteristic or combination of characteristics by which a material or object may be identified on an image or photograph.
Spoil Pile	A pile of excavated earth material.
Steady State	The period following peak project effects where all further effects level off and assume a "normal" rate of change.
Strutting Grounds	Areas of specific habitat suitable for breeding males of some bird species (such as grouse) to display and to court females
Subsidence	Movement in which surface material is displaced vertically downward.
Subsoil	A layer of shattered and partly weathered rock underlying the surface soil.
Substrate	The solid material on which an organism lives.
Sulfur Oxides	Compounds of sulfur combined with oxygen that have a significant influence on air pollution.
Surface Horizon	A soil layer intersecting the ground surface.
Surface Integrity	The tendency of the soil surface crust to remain bound together by minerals.
Talus	An accumulation of rock debris at the base of a cliff or steep slope.
Taxa	Groups of principal scientific classifications.
Tectonics	A branch of geology concerned with structure, especially with the deformation of the earth's crust caused by folding and faulting.
Telemetry Device	A device that permits transmission of measurements made at one site (e.g., a satellite) to another site at which they are recorded (e.g., a ground receiving station), via properly encoded radio signals or other appropriate transmission methods.
Temperature Inversion	An atmospheric condition produced by a set of geologic and atmospheric conditions so as to produce a layer or layers of air in which temperature increases with altitude.

Terrace — Relatively flat, horizontal, or gently inclining surfaces, sometimes long and narrow, which are bounded by a steeper ascending slope on one side and by a steeper descending slope on the opposite side.

Terrestrial — Inhabiting or pertaining to the land.

Tertiary — A period in geological history marking the beginning of the Cenozoic era, from 70 million years to one and half million years ago, characterized by the formation of high mountains and the dominance of mammals on land.

Throwweight — The weight of weapons, penetration aids, etc., that can be delivered by an ICBM over its design range.

Threatened Species — Any animal or plant species likely to become endangered within the foreseeable future throughout all or a significant portion of their range.

Tiering — The coverage of general matters in broad environmental statements with subsequent narrower statements or environmental analyses incorporating by reference the general discussions, but concentrating solely on the issues specific to the statement subsequently prepared.

Total Dissolved Solids — An aggregate of carbonates, bicarbonates, chlorides, sulfates, phosphates, and nitrates of calcium, magnesium, manganese, sodium, potassium, and other elements that form salts and are dissolved in water. High TDS values can adversely affect humans, animals, and plants. TDS is often used as a measure of salinity.

Trace Element — A chemical element found in small quantities (less than 1 percent) in a mineral or compound.

Tradeoff Studies — An examination of the balancing of environmental considerations with either cost or project performance; these factors are often not compatible and one must be given up in return for another.

Transmissivity — The rate at which water is transmitted through a unit width of aquifer under a unit hydraulic gradient.

Transporter	In the M-X system, a vehicle that transports a mobile launcher, conceals it during movement, and permits its undetected emplacement or removal at a protective structure. When the transporter is not carrying a launcher, it carries a mass simulator to minimize the possibility of detection of launcher movements.
Triassic	A period of geological history that marks the beginning of the Mesozoic era. The period extends from 195 to 225 million years ago, and is characterized by the development of such small mammals as the marsupial and insectivorous types.
Tributary	A stream feeding a larger body of water.
Transect	A long, narrow area within which biological, archaeological, soils or other data are gathered.
Understory	Underlying layer of low vegetation.
Ungulate	Possessing hoofs.
Vegetation Type	A plant community with distinguishable characteristics; generally refers to the species or various combinations of species which have similar stature, morphology, and appearance and which dominate or appears to dominate a site.
Vertical Temperature Stratification	Layers of atmosphere characterized by a constant temperature gradient.
Visual Sensitivity	As applied to visual resource management, that degree of concern expressed by the user toward scenic quality and existing or proposed visual change in a particular characteristic landscape.
Watershed	The area of higher ground lying between and thus dividing two drainage systems.
Weir	A fence or enclosure set in a body of water to trap fish.
Wetland	Water-dominated ecological communities generally constituting habitats.

Wilderness Study Areas — A roadless area which has been found to have wilderness characteristics subject to intensive analysis in the BLM planning system and to public review to determine wilderness suitability.

Wildlife Refuge — A national network of lands and waters sufficient in size and location, to provide through management and safeguards, habitats where migratory birds and other animals are enhanced and made available for human benefit.

Wind Field — Wind speed and direction throughout a three-dimensional field.

Withdrawal — A land area officially removed for a specific purpose from certain types of uses.

Xeric — Pertaining to arid conditions.

Xerophyte — A plant adapted for life in a dry environment.

Zooplankton — Microscopic invertebrates that float freely in water.

5.3 ACRONYMS

5.3 ACRONYMS

5.3.1 Acronyms

ACRONYM	MEANING
ADF	Average Daily Flow
ADT	Average Daily Traffic
A&CO	Assembly and Checkout
AFB	Air Force Base
AFM	Air Force Manual
AFR	Air Force Regulation
AFRCE-M-X	Air Force Regional Civil Engineer - M-X
AFSC	Air Force Systems Command
ALCC	Airborne Launch Control Center
AOA	Area of Analysis
APCD	Air Pollution Control District
AQCR	Air Quality Control Region
AQDM	Air Quality Display Model
AQMA	Air Quality Maintenance Area
AQMP	Air Quality Maintenance Plan
ASC	Area Support Center
AUM	Animal Unit Month
BEA	Bureau of Economic Analysis
BEBR	Bureau of Business and Economics Research
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BLS	Bureau of Labor Statistics
BMCA	Basing Mode Comparison Area
BMD	Ballistic Missile Defense
BMO	Ballistic Missile Office
BOD	Biological Oxygen Demand
BYU	Brigham Young University
C^3	Command, Control, and Communications
CAA	Clean Air Act

ACRONYM	MEANING
CALCOMP	California Computer Corporation
CDM	Climatological Dispersion Model
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CMF	Cluster Maintenance Facility
COE	Corps of Engineers
CSA	Contractor Support Area
CSF	Contractor Support Facility
DAA	Designated Assembly Area
DBMS	Data Base Management System
DDA	Designated Deployment Area
DASC	Deployment Area Support Center
DCP	Decision Coordination Paper
DEIS	Draft Environmental Impact Statement
DEISM	Demographic and Economic Impact Simulation Model
DEP	Division of Environmental Protection
DFC	Desert Fishes Council
DLE	Desert Land Entry
DMA	Defense Mapping Agency
DNL	Division of Natural Landmarks
DOA	United States Department of Agriculture
DOD	United States Department of Defense
DOE	United States Department of Energy
DOI	United States Department of the Interior
DOT	United States Department of Transportation
DPU	Duckwater Planning Unit
DRI	Desert Research Institute
DSARC	Defense Systems Acquisition Review Council
DTN	Designated Transportation Network
DWR	Department of Wildlife Resources
EAC	Economic Adjustment Committee
EDA	Economic Development Administration
EEI	Earnings, Employment, and Impact
EIAP	Environmental Impact Analysis Process
EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency
EPC	Environmental Protection Committee
ERC	Environment Reporter Cases
ESA	Endangered Species Act of 1973
ETR	Environmental Technical Report
FAA	Federal Aviation Administration
FARRRP	Forest and Rangeland Renewable Resources Planning Act
FCMA	Fishery Conservation and Management Act
FEIS	Final Environmental Impact Statement
FHBM	Flood Hazard Boundary Maps
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FLPMA	Federal Land Policy and Management Act of 1976
FMV	Fair Market Value

ACRONYM	MEANING
FOC	Full Operational Capability
FR	Federal Register
FRC	Federal Regional Council
FSED	Full-Scale Engineering Development
FWCA	Fish and Wildlife Coordination Act
FWPCA	Federal Water Pollution Control Act
FY	Fiscal Year
GIS	Geobased Information System
GMA	Game Management Area
GNP	Gross National Product
GPO	Government Printing Office
HCRS	Heritage Conservation and Recreation Service
HEW	United States Department of Health, Education, and Welfare
HIWAY	Highway Air Pollution Model
HQSAC	Headquarters Strategic Air Command
HSS	Historic Sites Survey
HUD	United States Department of Housing and Urban Development
IAS	Interagency Archaeological Services
ICBM	Intercontinental Ballistic Missile
ID	Inside Diameter
IHS	Indian Housing Service
IMPACT	Integrated Model for Plumes and Atmospherics in Complex Terrain
I/O	Input/Output
IOC	Initial Operational Capability
IPP	Intermountain Power Project
IR	Infra Red
KGRA	Known Geothermal Resource Areas
KGRF	Known Geothermal Resource Field
LAER	Lowest Achievable Emission Rate
LCPD	Lincoln County Power District
LANDSAT	Land Satellite
LEAA	Law Enforcement Assistance Administration
LFP	Labor Force and Population
LPN	Licensed Practical Nurse
LVN	Licensed Vocational Nurse
MCP	Military Construction Program
MF	Medium Frequency
MFS	Mountain Fuel Supply
MMPA	Marine Mammal Protection Act
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MPQ	Most Probable Quantity
MPRSA	Marine Protection Research and Sanctuaries Act
MPS	Multiple Protective Structure
MSL	Mean Sea Level
MSS	Mutispectral Scanner
MWP	Mount Wheeler Power

ACRONYM	MEANING
NA	Natural Area; Not Available
NAAQS	National Ambient Air Quality Standards
NAFB	Norton Air Force Base
NCA	Noise Control Act
NDFG	Nevada Department of Fish and Game
NDOW	Nevada Department of Wildlife
NEDS	National Emissions Data System
NEPA	National Environmental Policy Act
NHL	National Historic Landmarks
NHPA	National Historic Preservation Act
NH&S	Nuclear Hardness and Survivability
NMSA	New Mexico Statute Annotated
NNNPS	Northern Nevada Native Plant Society
NO_2	Nitrous Oxide
NOAA	National Oceanographic and Aeronautic Administration
NORA	Nevada Outdoor Recreation Association
NORAD	North American Air Defense Command
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NR	National Register of Historic Places
NRDC	Natural Resource Defense Council
NRNL	National Register Natural Landmark
NRS	Nevada Revised Statutes
NSPS	New Source Performance Standards
NTM	National Technical Means
NWPS	National Wilderness Preservation System
NWR	National Wildlife Refuge
OAHP	Office of Archaeology and Historic Preservation
OB	Operating Base
OB/DAA	Operating Base and Designated Assembly Area
OBTS	Operating Base Test Site
OCC	Operational Control Center
OEA	Office of Economic Adjustment
OMB	Office of Management and Budget
ORNL	Oak Ridge National Laboratory
ORV	Off-Road Vehicle
OSHA	Occupational Safety & Health Act
PAL	Point Area Line Model
PGT	Pacific Gas Transmission
PMOA	Programmatic Memorandum of Agreement
PDEIS	Preliminary Draft Environmental Impact Statement
PL	Public Law
PLU	Position Location Uncertainty
POL	Petroleum Oil Lubricant
PRIA	Public Rangelands Improvement Act of 1978
PS	Protective Structure
PSD	Prevention of Significant Deterioration
PSS	Physical Security System
QD	*Quantity-Distance*
QOL	Quality of Life

ACRONYM	MEANING
RARE II	Roadless Area Review and Evaluation II
RCRA	Resource Conservation and Recovery Act of 1976
RIMS	Regional Industrial Multiplier System
RF	Radio Frequency
RN	Registered Nurse
ROI	Region of Influence
ROSE	Resident Operational Support Equipment
ROSEE	Resident Operational Support Equipment Enclosure
RSS	Remote Surveillance Site
SAC	Strategic Air Command
SAK	Subject Access Key
SAL	Strategic Arms Limitation
SALT	Strategic Arms Limitation Treaty/Talks
SAROAD	Storage and Retrieval of Aerometric Data
SCORP	Statewide Comprehensive Outdoor Recreation Plan
SCS	Soil Conservation Service
SCUBA	Self Contained Underwater Breathing Apparatus
SEA	State Economic Area
SHPO	State Historic Preservation Office
SIAM	Socioeconomic Impact Analysis Model
SIC	Standard Industrial Code
SL	Sensitivity Level
SLBM	Submarine-Launched Ballistic Missile
SMSA	Standard Metropolitan Statistical Area
SPO	Systems Program Office
SRM	Systematic Ranking Methodology
STV	Special Transport Vehicle
TDS	Total Dissolved Solids
TGA	Taylor Grazing Act
TSCA	Toxic Substances Control Act
TSP	Total Suspended Particulates
UCA	Utah Code Annotated
UDPR	Utah Division of Parks and Recreation
UNAMAP	Users Network for Applied Models of Air Pollution
UNSWE	Unique and Nationally Significant Wildlife Ecosystem
UPED	Utah Process Economic Demographic Impact Model
URA	Unit Resource Area; Unit Resource Analysis
URAA	Uniform Relocation Assistance Act
USAF	United States Air Force
USC	United States Code
USDA	United States Department of Agriculture
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UTM	Universal Transverse Mercator
VAFB	Vandenberg Air Force Base
VOR	Visual Obstruction Reading
WADS	Water Availability Data System
WMA	Wildlife Management Area
WRC	Water Resources Council

WPPP	White Pine Power Project
WSA	Wilderness Study Area
WUIS	Water Use Information System

5.3.2 Symbols For Chemical Elements and Other Abbreviations

afy	Acre feet per year
cf	Cubic foot
CO	Carbon monoxide
cy	Cubic yard
dbh	Diameter at breast height
dm	Decimeter
gpm	Gallons per minute
gpcd	Gallons per capita per day
ha	Hectare
hc	Hydrocarbon
hfu	Heat flow units
hr	Hour
km_2	Kilometer
km^2	Square kilometers
kv	Kilovolt
kw	Kilowatt
kwh	Kilowatt hour
m_2	Meter
m^2	Square meters
mg	Million gallons
mgd	Million gallons per day
mgs	Million gallons per second
mi_2	Miles
mi^2	Square miles
m/sec	Meters per second
mw	Megawatt
mwh	Megawatt hour
NO_2	Nitrous oxide
O_3	Ozone
ppm	Parts per million
SO_2	Sulfur dioxide

5.4 LIST OF EIS PREPARERS

5.4 LIST OF EIS PREPARERS

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Facilitators, Inc.
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Resource Concepts, Inc.
John McLain

Westec Services, Inc.
John Westermeier

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Woodward Clyde Consulting, San Francisco

5.5 DISTRIBUTION LIST

5.5 DISTRIBUTION LIST

5.5.1 Congressional Delegations: Nevada, Utah, Texas, and New Mexico

5.5.2 Federal Government Agencies

DEPARTMENTS

Department of Agriculture

- Farmers Home Administration
- Agricultural Stabilization and Conservation Service
- Forest Service
- Soil Conservation Service

Department of Commerce

- Regional Action Planning Commissions

Department of Defense

- Army Corps of Engineers
- Naval Facilities Engineering Command
- Air Force Regional Civil Engineers
- Defense Mapping Agency
- Defense Nuclear Agency
- Defense Communications Agency
- Office of Economic Adjustment

Department of Energy

Department of Education

Department of Health and Human Services

Department of Housing and Urban Development

Department of Interior

- o U.S. Fish and Wildlife Service
- o National Park Service
- o Bureau of Mines
- o Geological Survey
- o Bureau of Indian Affairs
- o Bureau of Land Management
- o Heritage Conservation and Recreation Service
- o Office of Surface Mining, Reclamation and Enforcement
- o Water and Power Resources Service

Department of Labor

- o Occupational Safety and Health Administration

Department of Transportation

- o Federal Aviation Administration
- o Federal Highway Administration

AGENCIES

Action

- o Arms Control and Disarmament Agency
- o Community Service Administration
- o Environmental Protection Agency
- o General Services Administration
- o Small Business Administration
- o Nuclear Regulatory Commission

FEDERAL REGIONAL COUNCILS

COUNCIL ON ENVIRONMENTAL QUALITY

ADVISORY COUNCIL ON HISTORIC PRESERVATION

WATER RESOURCES COUNCIL

5.5.3 State Government Agencies

State Executive - Nevada, Utah, Texas, New Mexico
State Legislature - Nevada, Utah, Texas, New Mexico
State A-95 Clearinghouse - Nevada, Utah, Texas, New Mexico

State Planning Offices

- o New Mexico State Planning Office
- o Texas Office of Budget and Planning
- o Utah State Planning Agency
- o Nevada Office of Planning Coordination

State M-X Offices

- o Nevada M-X Field Office
- o Utah M-X Coordination Office

5.5.4 Local Government Agencies

COUNTIES	CITIES
Nevada	Nevada
Esmeralda	Las Vegas
Eureka	Elv
Lander	Pioche
Lincoln	Caliente
Nye	Tonopah
White Pine	
Utah	Utah
Beaver	St. Lake City
Iron	Milford
Juab	Delta
Millard	Cedar City
Tooele	Beaver
Texas	Texas
Bailey	Amarillo
Castro	Lubbock
Cochran	Plainview
Dallam	Hereford
Deaf Smith	Dalhart
Hartley	Dumas
Hockley	
Lamb	
Moore	
Oldham	
Parmer	
Potter	
Randall	
Sherman	
Swisher	
New Mexico	New Mexico
Chaves	Roswell
Curry	Clovis
Debaca	Tucumcari
Guadalupe	Santa Rose
Lea	Clayton
Quay	
Roosevelt	
Union	

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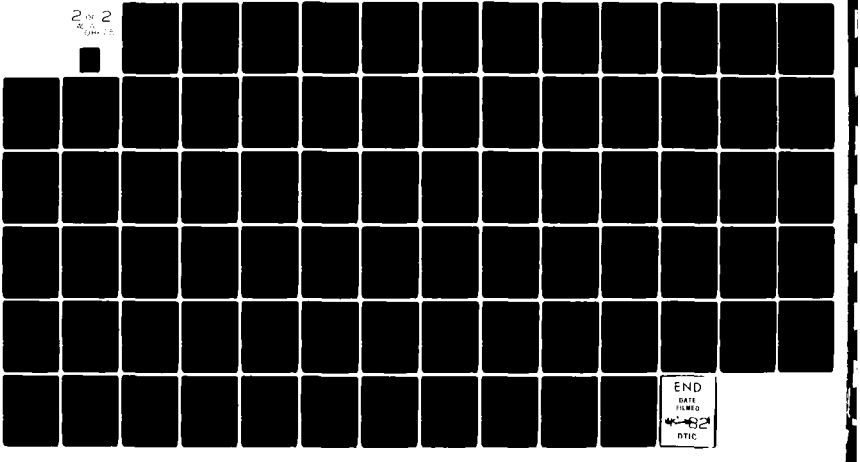

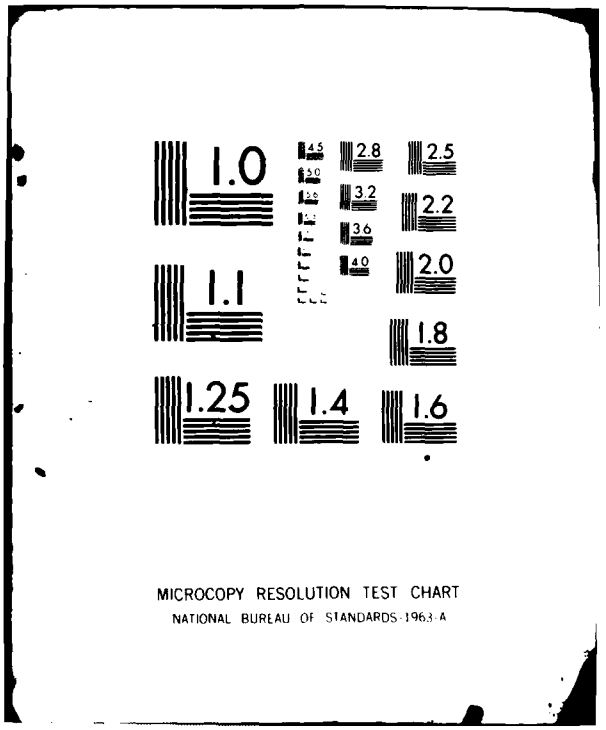
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5.5.5 National Organizations

American Anthropological Association
AAAS - American Association for the Advancement of Science
American Association of Petroleum Geologists
American Association of Planners
American Economics Association
American Friends Service Committee
AIBS - American Institute of Biological Sciences
American Water Resource Council
Audubon Society
Botanical Society of America
Center for Defense Information
Center for Law and Social Policy
Conservation Foundation
Ecological Society of America
Environmental Defense Fund
Friends Committee on National Legislation
Friends of the Earth
League of Women Voters
National Cattlemen's Association
National Parks and Conservation Association
National Science Foundation
National Wildlife Federation
Regional Science Association
SANE
Sierra Club
Society for American Archaeology
Society for Range Management
The Wilderness Society
The Wildlife Society
Union of Concerned Scientists

5.5.6 State Local Organizations

ORGANIZATION	CITY	STATE
Albuquerque Wildlife Federation	Albuquerque	NM
Archaelogical Society of Utah	Sandy	UT
Ashley Valley Woolgrowers	Jensen	UT
Brine Shrimp Alliance	Salt Lake City	UT
Center for Environmental Research	Albuquerque	NM
Central Utah Wildlife Association	Centerfield	UT
Chaves County Wildlife Federation	Roswell	NM
Citizen Alert	Reno	NV
Council on Utah Resources	Salt Lake City	UT
Desert Fish Council	Death Valley	CA
Duckwater Shoshone Tribe	Duckwater	NV
Ely Colony Council	Ely	NV
Environmental Forum	Las Vegas	NV
Escalante Wilderness Committee	Salt Lake City	UT
Fishlake Woolgrowers	Ephraim	UT
Friends of Nevada Wilderness	Carson City	NV
Iron County Historical Society	Cedar City	UT
Izaak Walton League	Salt Lake City	UT
Milford Wildlife Protection Association	Milford	UT

ORGANIZATION	CITY	STATE
Nevada Cattlemen's Association	Elko	NV
Nevada Conservation Forum	Reno	NV
Nevada Indian Environmental Research Project	Reno	NV
Nevada Intertribal Council	Reno	NV
Nevada Mining Association	Elko	NV
Nevada Public Land Users Association	Henderson	NV
Nevada Wildlife Federation	Sparks	NV
Nevada Woolgrower's Association	Ely	NV
Nevadans Opposed to M-X	Las Vegas	NV
New Mexico Cattle Grower's Association	Albuquerque	NM
New Mexico Conservation Coordinating Council	Albuquerque	NM
New Mexico Wilderness Study Committee	Albuquerque	NM
New Mexico Wildlife Society	Albuquerque	NM
New Mexico Woolgrower's Association	Roswell	NM
No M-X	Ely	NV
Northern Nevada Native Plant Society	Reno	NV
Renewable Natural Resource Center	Reno	NV
Sage Brush Alliance	Las Vegas	NV
Sevier Wildlife Association	Richfield	UT
Southern New Mexico Grazing Association	Dell City	TX
Southern Nevada Conservation Council	Las Vegas	NV
Southwest Preservation Foundation	Santa Fe	NM
Southwest Resource Council	Hurricane	UT
The Navajo Tribe	Window Rock	AZ
United Nations Association of Utah	Salt Lake City	UT
Utah Cattlemen's Association	Salt Lake City	UT
Utah Farm Bureau Federation	Murray	UT
Utah Statewide Archaeological Society	Granger	UT
Utah Water Users Association	Heber City	UT
Ute Indian Tribe	Ft. Duchesne	UT
Women in Mining	Battle Mountain	NV
Women's Conservation Council of Utah	Salt Lake City	UT

5.5.7 General Public

A significant number of individuals have requested copies of the DEIS and the number grows daily. A list of these individuals is being maintained by the Ballistic Missile Office, AFRCE-M-X/DEV, Norton AFB, California, separately from this document. Copies of the DEIS will be sent to each requestor.

5.5.8 Location of Reference Copies

LIBRARY	CITY	STATE
Abilene Public Library	Abilene	TX
Albuquerque Public Library	Albuquerque	NM
Amarillo College Learning Resource Center	Amarillo	TX
Amarillo Public Library	Amarillo	TX
American Fork City Library	American Fork	UT
Austin Public Library	Austin	TX

LIBRARY	CITY	STATE
Baylor University Moody Memorial Library	Waco	TX
Beaver County Public Library	Beaver	UT
BLM - Arizona Strip Dist Office Library	St. George	UT
BLM - Battle Mountain Dist Office Library	Battle Mountain	NV
BLM - Elko Dist Office Library	Elko	NV
BLM - Ely Dist Office Library	Ely	NV
BLM - Kanab Dist Office Library	Kanab	UT
BLM - Las Vegas Dist Office Library	Las Vegas	NV
BLM - Roswell Dist Office Library	Roswell	NM
BLM - Utah State Office Records Office Library	Salt Lake City	UT
BLM Library - Federal Bldg	Reno	NV
Boulder City Library	Boulder City	NV
Brigham City Library	Brigham City	UT
Bureau of Land Management Library	Albuquerque	NM
Cannon AFB Library	Cannon AFB	NM
Canyon Public Library	Canyon	TX
Carlsbad Public Library	Carlsbad	NM
Carnegie Public Library	Las Vegas	NM
Carson Co. Public Library	Panhandle	TX
Cedar City Public Library	Cedar City	UT
Chapman Branch Library	Salt Lake City	UT
Churchill County Library	Fallon	NV
Clark Co. Community College Learning Resource Center	N. Las Vegas	NV
Clark Co. Library Dist - Bunkerville Branch	Bunkerville	NV
Clark Co. Library Dist - Charleston Heights Branch	Las Vegas	NV
Clark Co. Library Dist - Flamengo Branch	Las Vegas	NV
Clark Co. Library Dist - Moapa Valley Branch	Las Vegas	NV
Clark Co. Library Dist - Sunrise Branch	Las Vegas	NV
Clark Co. Library Dist - Virgin Valley Branch	Mesquite	NV
Clark Co. Library Dist - West Las Vegas Branch	Las Vegas	NV
Clark County Library District	Las Vegas	NV
Claude Public Library	Claude	TX
Clayton Public Library	Clayton	NM
Clovis-Carter Public Library	Clovis	NM
Cochran Co. Library	Morton	TX
College of Santa Fe Fogelson Library Center	Santa Fe	NM
College of the Southwest	Hobbs	NM
Dallam County Library	Dalhart	TX
Dallas County Library	Dallas	TX
Davis County Library	Farmington	UT
Deaf Smith County Library	Hereford	TX
Delta City Library	Delta	UT
Dixie College Library	St. George	UT
Douglas Co. Public Library	Minden	NV

LIBRARY	CITY	STATE
Eastern NM University Library	Portales	NM
Eastern NM University Clovis Campus Library	Clovis	NM
Eastern NM University Roswell Campus Library	Roswell	NM
Eastern Plains Regional Library	Tucumcari	NM
El Paso Public Library	El Paso	TX
Elko County Library	Elko	NV
Emery County Library	Castle Dale	UT
Envir. Protection Agency Region VI Library	Dallas	TX
Ephraim City Library	Ephraim	UT
Eunice Public Library	Eunice	NM
Fillmore City Library	Fillmore	UT
Fish Lake Valley Library	Tonopah	NV
Floyd Co. Library	Floydada	TX
Fort Worth Public Library	Ft. Worth	TX
Fort Sumner Public Library	Ft. Sumner	NM
Fred Macaron Library	Springer	NM
Friona Public Library	Friona	TX
Gabie Betts Burton Memorial Library	Claredon	TX
Gerrity Memorial Library	Hill AFB	UT
Gruner City Library	Gruner	TX
Hale Center Public Library	Hale Center	TX
Harold B. Lee Library	Provo	UT
Harris Co. Public Library	Houston	TX
Henderson Dist Public Library	Henderson	NV
Hobbs Public Library	Hobbs	NM
Hockley Co. Memorial Library	Levelland	TX
Houston Public Library	Houston	TX
Hutchinson County Library	Borger	TX
Kendrick Memorial Library	Brownfield	TX
Killgore Memorial Library Moore Co. Library	Dumas	TX
Lamb County Library	Littlefield	TX
Lee Library - BYU	Provo	UT
Lincoln County Library	Pioche	NV
Lincoln County Library - Caliente	Caliente	NV
Logan Library	Logan	UT
Lovett Memorial Library	Pampa	TX
Lovington Public Library	Lovington	NM
Lubbock Christian College Moody Library	Lubbock	TX
Lubbock City - County Library	Lubbock	TX
Mineral County Public Library	Hawthorne	NV
Moise Memorial Library	Santa Rosa	NM
Muleshoe Area Public Library	Muleshoe	TX
Murray Public Library	Murray	UT
Nellis AFB Library	Nellis AFB	NV
Nephi City Library	Nephi	UT
Nevada State Library	Carson City	NV

LIBRARY	CITY	STATE
Nevada Un. of Library	Las Vegas	NV
New Mexico Highlands Univ Donnelly Library	Las Vegas	NM
New Mexico State Library	Santa Fe	NM
New Mexico State University Library	Las Cruces	NM
NM Military Institute Learning Research Center	Roswell	NM
North Las Vegas Municipal Library	N. Las Vegas	NV
Orem Public Library	Orem	UT
Pannell Library and Instructional Resources Center	Hobbs	NM
Ornesby Public Library	Carson City	NV
Parowan Public Library	Parowan	UT
Payson Public Library	Payson	UT
Pleasant Grove City Library	Pleasant Grove	UT
Portales Public Library	Portales	NM
Post Library	Dogway	UT
Price City Library	Price	UT
Provo City Public Library	Provo	UT
Raton Public Library	Raton	NM
Richfield City Library	Richfield	UT
Roswell Public Library	Roswell	NM
Salt Lake City Public Library	Salt Lake City	UT
Salt Lake Co. Library, A.E. Peterson Branch	Sandy	UT
Salt Lake Co. Library, C.S. Smith Branch	Salt Lake City	UT
Salt Lake Co. Library, E. Mill Crk Branch	Salt Lake City	UT
Salt Lake Co. Library, Gronger Branch	Gronger	UT
Salt Lake Co. Library, Halladay Branch	Salt Lake City	UT
Salt Lake Co. Library, Kearns Branch	Kearns	UT
Salt Lake Co. Library, Magna Branch	Magna	UT
Salt Lake Co. Library, R.V. Tyler Branch	Midvale	UT
Salt Lake Co. Library, South Jordan Branch South	Jordan	UT
Salt Lake Co. Library, South Salt Lake City Branch	Salt Lake City	UT
Salt Lake County Library, Whitmore Library	Salt Lake City	UT
San Antonio Public Library	San Antonio	TX
Santa Fe Public Library	Santa Fe	NM
Scarborough Memorial Library	Hobbs	NM
Sherman Co. Public Library	Stratford	TX
Sierra Nevada College Library	Incline Village	NV
Silverton Library - Courthouse	Silverton	TX
Southeastern Regional Library	Lovington	NM
Southern Methodist Univ. Libraries	Dallas	TX
Southern Utah State College Library	Cedar City	UT
Spanish Fork City Library	Spanish Fork	UT
Swisher Co. Library - Swisher Memorial Bldg	Tulia	TX

LIBRARY	CITY	STATE
Tatum Community Library	Tatum	NM
Texas Dept of Water Resources Library	Austin	TX
Texas Southern Univ Library	Houston	TX
Texas State Library	Austin	TX
Texas Tech Univ Library	Lubbock	TX
Tonopah Public Library	Tonopah	NV
Tooele Public Library	Tooele	UT
TX Christian Univ Mary Couts Barnett Library	Fort Worth	TX
Unger Memorial Library	Plainview	TX
Univ of Albqu. Center for Learning and Information Research	Albuquerque	NM
Univ of Dallas Wm. A. Blakley Library	Irving	TX
Univ of Houston M.D. Anderson Memorial Library	Houston	TX
Univ of New Mexico General Library	Albuquerque	NM
Univ of Texas General Library	El Paso	TX
Univ of Texas, Marabeau B. Lamar Library	Austin	TX
Univ of Utah, Mariott Library	Salt Lake City	UT
Univ of Nevada, Reno, Nobel Getchell Library	Reno	NV
US Army Corps of Engineers Albuquerque Dist	Albuquerque	NM
US Army Southwestern Div Corps of Engineers Library	Dallas	TX
Utah State Library Commission	Salt Lake City	UT
Utah State University Merrill Library	Logan	UT
Van Howeling Memorial Library	Plainview	TX
Wasatch Co. Library	Heber	UT
Washington Co. Library	St. George	UT
Washoe Co. Library	Reno	NV
Weber Co. Library	Ogden	UT
Weber State College Library	Ogden	UT
West Texas State Univ Cornette Library	West TX Station	TX
White Pine County Library	Ely	NV
William Marsh Rice Univ Fondren Library	Houston	TX
Woolworth Community Library	Jol	NM
Yoakum County Library	Plains	TX
Yoakum County Library	Denner City	TX

5.6 PROGRAMMATIC MEMORANDUM OF AGREEMENT

5.6 PROGRAMMATIC MEMORANDUM OF AGREEMENT

The following is the current text of the proposed Programmatic Memorandum of Agreement. The document has not as yet been executed by all concerned parties, although the Advisory Council on Historic Preservation and the U.S. Air Force have both signed the current document. Since this language could change slightly before finalization, it is not possible to reproduce the actual document at this time.

PROGRAMMATIC MEMORANDUM OF AGREEMENT

WHEREAS, the U.S. Air Force, Department of Defense, proposes to deploy the M-X System (undertaking) within the States of Nevada, New Mexico, Texas, and/or Utah; and,

WHEREAS, the M-X System may be deployed on land managed by the Bureau of Land Management (BLM), and BLM and the Air Force have management responsibilities, with regard to historic properties pursuant to Executive Order 11593, and the National Historic Preservation Act of 1966 (16 U.S.C. Sec. 470f, as amended, 90 Stat. 1320); and,

WHEREAS, the Air Force has assumed lead agency status and primary responsibility for compliance with the historic preservation statutes and regulations referenced herein on behalf of both itself and BLM; and,

WHEREAS, the Air Force, in consultation with the State Historic Preservation Officers (SHPOs), has determined that the proposed undertaking could have effects upon historic and cultural properties included in or eligible for inclusion in the National Register of Historic Places (Register); and,

WHEREAS, pursuant to Section 106 of the National Historic Preservation Act of 1966, Section 2(b) of Executive Order 11593, and Section 800.4 of the regulations of the Advisory Council on Historic Preservation (Council), "Protection of Historic and Cultural Properties" (36 CFR Part 800), the Air Force has requested the comments of the Council; and,

WHEREAS, pursuant to 36 CFR Sec. 800.8(a) of the Council's regulations, the Air Force has requested development of a Programmatic Memorandum of Agreement (Agreement); and,

WHEREAS, the Air Force, the Council, BLM, and the SHPOs of Nevada, New Mexico, Texas, and Utah have consulted and will continue to consult and review the undertaking to consider feasible and prudent alternatives to avoid, minimize, or satisfactorily mitigate adverse effects,

NOW, THEREFORE, it is mutually agreed that implementation of the undertaking in accordance with the following stipulations will avoid or satisfactorily mitigate its adverse effects on historic and cultural properties.

Stipulations

The Air Force will insure that the following measures are carried out.

1. General.

   A. The Air Force will establish a Review Committee to assist in oversight of all historic preservation related M-X activities to insure that such activities meet high standards of professional methodology. The committee will report to the Executive Director of the Council and to the Air Force, and will act and be funded in accordance with Attachment 1.

   B. The Air Force will afford the appropriate SHPOs, and the state offices of BLM, opportunity to review and comment on all scopes of work, and significant revisions of such scopes, relating to historic preservation; and the opportunity to review and comment on the historic preservation reports or products generated under this Agreement. Informational copies of these documents will be provided to the Council.

   C. The Air Force will provide data generated under this Agreement to the appropriate SHPOs and State offices of BLM.

   D. The Air Force, in consultation with appropriate SHPOs, will notify the public of intended significant actions under this Agreement, will provide timely notice to news media, and will afford the public the opportunity to comment to the Air Force, the SHPOs, or the Council regarding these actions.

   E. The Air Force, in consultation with the appropriate SHPOs, will ensure that all historic preservation activities are carried out by or under the supervision of, qualified persons as prescribed in 36 CFR Sec. 1201.5.

   F. The Air Force will ensure that all stipulations of this Agreement are met by its contractors as well as by all participating units of the Air Force.

   G. The Air Force, in consultation with the appropriate SHPOs, will ensure that its contractors and Air Force personnel and resident dependents are advised against illegal collection of historic and prehistoric materials, will encourage those with interests in such materials to participate in

nondestructive activities, and will cooperate with BLM to insure enforcement of the Archaeological Resources Protection Act of 1979.

H. Pursuant to 36 CFR Sec. 800.8 of the Council's regulations, the Air Force will submit an annual report to the Council, the SHPOs, and to Interagency Archaeological Services (Heritage Conservation and Recreation Service, Department of the Interior) on all actions taken pursuant to this Agreement.

I. The Air Force will provide data to assist the SHPO's in identifying and documenting the budgetary and staff impacts arising from this undertaking.

II. Identifying and Mitigating Adverse Effects of Construction and Operation.

A. In consultation with BLM and the appropriate SHPOs, and in accordance with the guidelines in Attachment II, the Air Force will locate and identify historic properties in the potential impact area, determine their significance, and assess the undertaking's impact upon them by:

1. development of an initial study plan, including but not limited to:

(a) Definition of preliminary study goals

(b) establishment of study methods

(c) indication of predicted types of historic and cultural properties

(d) establishment of study team composition

(e) establishment of programs for data storage, management, and use which are, to the extent feasible, compatible with existing State and BLM systems,

(f) development of a calendar of tasks (see Attachment II);

2. conducting preliminary studies based on the study plan, including background data and field inspection of sample areas during initial environmental analyses of the potential impact areas, to predict where adverse effects upon historic and cultural properties are likely to occur;

3. development and implementation of a plan for intensive field survey of all locations where adverse effects upon historic and cultural properties are likely to occur in the vicinity of potential MX permanent and temporary facilities such as base sites, access and utility corridors, borrow sources, and other MX support facilities. This plan will include:

(a) description of historic and cultural property types expected

(b) predicted distributions of historic and cultural properties

(c) study questions to be addressed

(d) study methods; including methods of field inspection, testing, and analysis

(e) study team composition

(f) data storage and management program.

B. Where prudent and feasible, in consultation with the SHPOs and BLM, the Air Force will avoid adverse effects on historic and cultural properties through design of M-X facilities by relocation of existing facilities or by other means.

C. In consultation with the SHPOs and BLM, the Air Force will develop guidelines for documentation or data recovery from historic and cultural properties that cannot be avoided or protected. The guidelines will take into account:

1. the data generated by the preliminary and intensive studies

2. the concerns of local communities and social and ethnic groups

3. the Native American Religious Freedom Act

4. 36 CFR Part 66 and its appendices published by the Department of the Interior on January 28, 1978 (42 FR 5374-82)

5. the standards of the Society of Professional Archaeologists

6. other applicable Federal regulations, standards, and guidelines.

D. The Air Force will in a timely manner deliver copies of the initial study plans (II.A.1) and guidelines for data recovery (II.C) to the Review Committee, the State BLM offices, and the appropriate SHPO and afford them 15 working days after receipt, to review them. The Review Committee, SHPO, and BLM will provide written notice of receipt and indicate their objections, if any, within 15 working days. Should the Review Committee, SHPO, or BLM object, the Air Force will arrange a meeting to resolve differences before proceeding with the action to which the Review Committee, SHPO, or BLM has objected. If the differences cannot be resolved, the Air Force will take the comments to the Committee, SHPO, and BLM into account in deciding whether to and how to proceed.

E. When it is not prudent or feasible to avoid adverse effects upon a historic or cultural property, the Air Force will follow 36 CFR Part 1204 to determine whether the property is eligible for inclusion in the Register, and consult with the appropriate SHPO and BLM as appropriate, and,

1. if the affected property meets criteria for listing in the Register primarily because it may yield information important in prehistory or history, the Air Force will institute a documentation or data recovery program in accordance with the Guidelines established under Stipulation II.C. Prior to initiating any documentation or data recovery program, the Air Force will notify the Review Committee, BLM, SHPOs, and any concerned local communities, or social and ethnic groups. Should an objection be raised, the Air Force will consult with the objecting party to resolve the objection. If no agreement can be reached among the Air Force, the SHPO, and BLM on the documentation or data recovery program, the Air Force will request the comments of the Council pursuant to 36 CFR Sec. 800.6;

2. if the affected property is determined eligible for listing in the Register for reasons other than, or in addition to, its information potential, the Air Force will consult with the appropriate SHPO to determine the nature of the undertaking's effect on the property and, pursuant to 36 CFR Sec. 800.4(d), request Council comments.

F. Pursuant to the American Indian Religious Freedom Act of 1978 (P.L. 95-341), the Air Force will consult with groups that have cultural ties to the study area in order to identify locations and issues of concern to them and to work with these groups and the parties to this Agreement in resolving conflicts. The Air Force will take the concerns of these groups into consideration during the design and construction of the undertaking, and during implementation of this Agreement.

G. During the implementation of any portion of the undertaking, should previously unknown historic or cultural properties be discovered, the Air Force will comply with 36 CFR Sec. 800.7 and/or the data recovery guidelines developed under paragraph C above.

H. Before M-X construction is complete, the Air Force will consult with the SHPOs and the BLM to establish preservation mechanisms to accompany operation and maintenance of the facilities. Operation and maintenance will also be covered under this Agreement.

III. The Air Force and the Council will work together as members of the Economic Adjustment Committee in an effort to ensure that Federal Government activities to accommodate population and infrastructure growth resulting from M-X deployment are sensitive to the historic and cultural values of the deployment areas. The parties agree in principle that the Federal Government should assist affected States and communities in the development and implementation of programs that will contribute to protection of the historic and cultural character of communities subject to short-or-long term growth as the direct or indirect results of the undertaking. Such programs should be commensurate in scope with the level of projected impact of the undertaking on each affected community, and include but not be limited to:

A. identification of districts, sites, buildings, structures, and objects included in or eligible for inclusion in the Register within each community;

B. development and implementation of measures to minimize destruction and maximize preservation and reuse of historic sites, buildings, structures, districts, and objects in Federal construction and assistance projects within each affected community;

C. establishment of design guidelines to make new construction as compatible as possible with the historic environment of each community; and,

E. establishment of measures to foster successful integration of new facilities into the existing cultural and architectural fabric of each community.

IV. Avoiding Inadvertent Damage During Pre-Construction Studies

A. The Air Force will ensure that proper coordination occurs between its personnel and contractors responsible for historic preservation and its personnel and contractors responsible for environmental, geological, engineering, and other studies, to minimize the danger posed to historic properties by geological testing, survey teams, and other activities and personnel. Intensive surveys will be conducted in advance of any land-modifying activity. Geological test sites and other locations of land-modifying activity will be designed to avoid damage to historic properties.

B. If test excavations are necessary to obtain data needed for the evaluation of historic properties under Stipulations II.A.2 and II.A.3 above, the excavations will not be allowed to exceed the scope necessary for basic evaluation, will not utilize mechanized equipment without the approval of the appropriate SHPO and BLM, and will be carried out in accordance with strict archaeological controls.

V. Definitions

As used in this Agreement:

A. Air Force means the U.S. Air Force acting by itself or through agents or contractors.

B. Historic and Cultural Properties means properties included in or likely to meet the criteria for inclusion in the National Register of Historic Places.

C. Historic preservation includes, but is not limited to, the identification, evaluation, protection, rehabilitation, reuse, recording of, and salvage of historic properties.

D. Potential Impact Area means the area in which the undertaking may reasonably be thought to have potential positive or adverse, direct or indirect effects upon historic properties.

_____ (date)

Executive Director

_____ (date)

U.S. Air Force

_____ (date)

Bureau of Land Management

_____ (date)

Nevada State Historic Preservation Officer

_____ (date)

Texas State Historic Preservation Officer

_____ (date)

Utah State Historic Preservation Officer

_____ (date)

New Mexico State Historic Preservation Officer

_____ (date)

Chairman
Advisory Council on Historic Preservation

ATTACHMENT 1

Review Committee Guidelines

A. Responsibilities

1. To monitor progress of the M-X Historic Preservation Program and advise the Air Force and Council of any actions needed to ensure maintenance of high professional standards.

2. To review guidelines, scopes of work, research designs, survey reports, and other documents developed by the Air Force and to advise the Air Force and the Council on any changes appropriate to ensure maintenance of high professional standards.

3. To assist in the resolution of disputes that may arise over the quality or appropriateness of particular historic preservation related activities, or of the M-X Historic Preservation Program in general.

B. Organization:

1. Membership will consist of:

a. the Executive Director of the Council and the Secretary of the Air Force or their designees, who will co-chair the committee;

b. the Director of BLM or his designee;

c. the following non-Federal members who will be appointed by the Executive Director and the Secretary of the Air Force:

1) one professional archaeologist knowledgeable in the archaeology of each general basing region (e.g., Texas, New Mexico, Utah/Nevdada)

2) one professional historian, preferably one with a knowledge of architectural history who is also knowledgeable in the history of each general basing region

4) other members as the Secretary of the Air Force and Executive Director may determine to be necessary.

2. Procedures:

a. the committee will meet at the call of the co-chairmen;

b. the committee may assign tasks to subcommittees or individual members;

c. the Air Force will provide staff support; and,

d. the committee will forward any meeting announcements, minutes, and other documents afforded to committee members to the SHPOs.

3. Funding: The Air Force will fund:

a. costs of travel and per diem;

b. stipend not to exceed $100 per day for non-Federal committee members engaged in committee business;

c. postage and telephone.

ATTACHMENT 2

Guidelines: Calendar of Tasks

Task I.

A. Initial study plan (II.A.1)

B. Establish review committee (I.A.,Atch.1)

Task II.

A. Conduct preliminary studies (II.A.2)

B. Develop plan for intensive field survey (II.A.3)

C. Develop guidelines for documentation and data recovery (II.C.)

Task III.

A. Conduct intensive field survey (II.A.3)

B. Redesign to avoid historic properties where feasible and prudent (II.B).

Task IV.

A. Determine eligibility and effect, and mitigate adverse effects (II.E.)

Consultation occurs, and comments are considered, at the beginning and completion of each task.

5.7 BIBLIOGRAPHIC NOTE

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Persons or organizations who wish to obtain a copy of the six volume M-X: Milestone II Final EIS (FEIS) may order these documents for a nominal charge by writing or calling:

U.S. Department of Commerce
National Technical Information Service
5285 Port Royal Road
Springfield, VA 22151
Telephone Number (703) 557-4600

Use of the following DDC/NTIS Accession numbers will expedite acquisition of the documents:

- AD A063491, HQ AFSC-TR-79-01, Volume I; M-X: Milestone II FEIS, Volume I, Program Overview
- AD A063492, HQ AFSC-TR-79-01, Volume II; M-X: Milestone II FEIS, Volume II, FSED
- AD A063493, HQ AFSCO-TR-70-01, Volume III; M-X: Milestone II FEIS, Volume III, Missile Flight Testing
- AD A063494, HQ AFSCO-TR-70-01, Volume IV; M-X: Milestone II FEIS, Volume IV, Basing Mode Evaluation
- AD A063495, HQ AFSC-TR-79-01, Volume V; M-X: Milestone II FEIS, Volume V, Appendices
- AD A063496, HQ AFSC-TR-79-01, Volume VI; M-X: Milestone II FEIS, Volume VI, Public Comments.

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